THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1365.] LONDON, JULY 9, 1889. [41ST YEAR. Price 6d.

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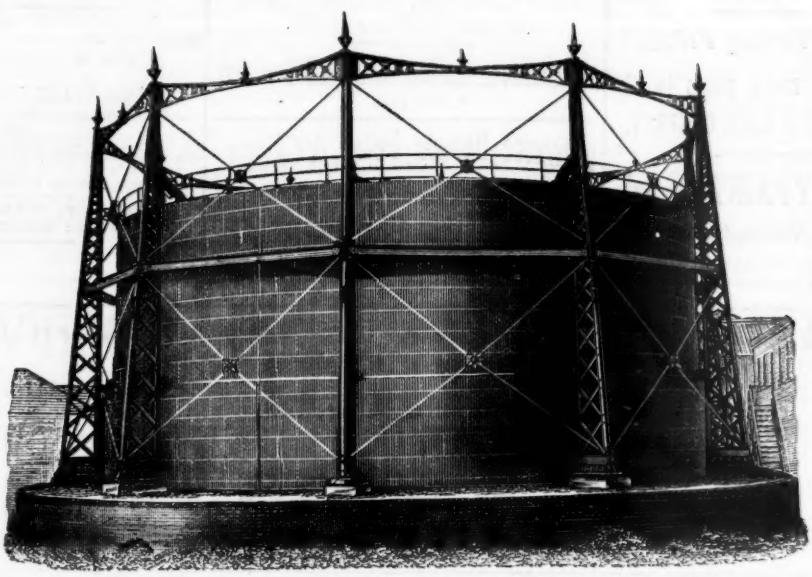

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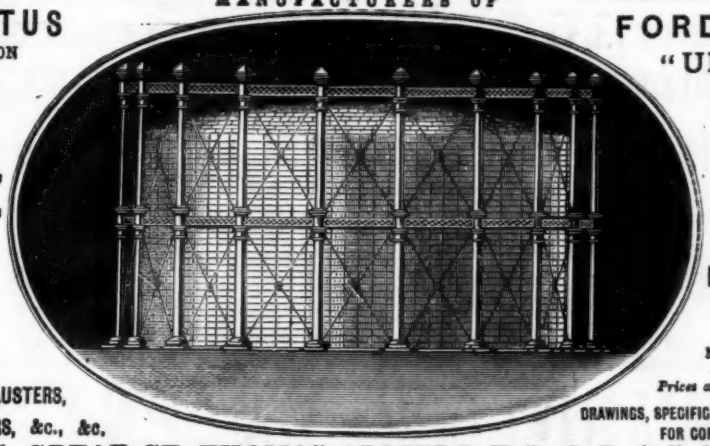

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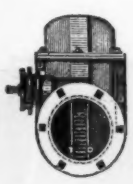

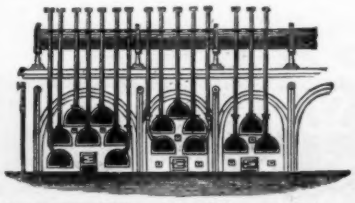

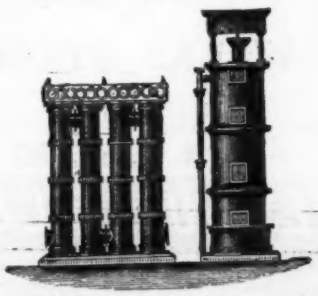

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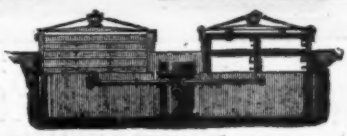

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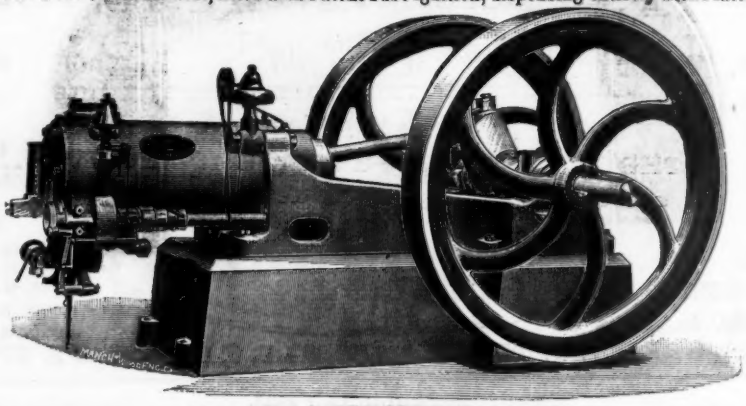

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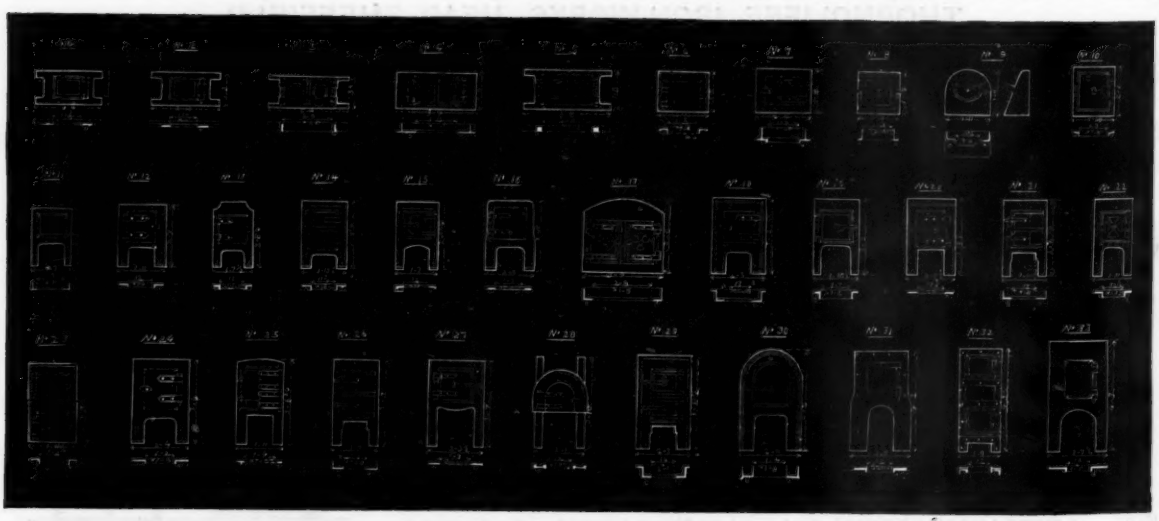

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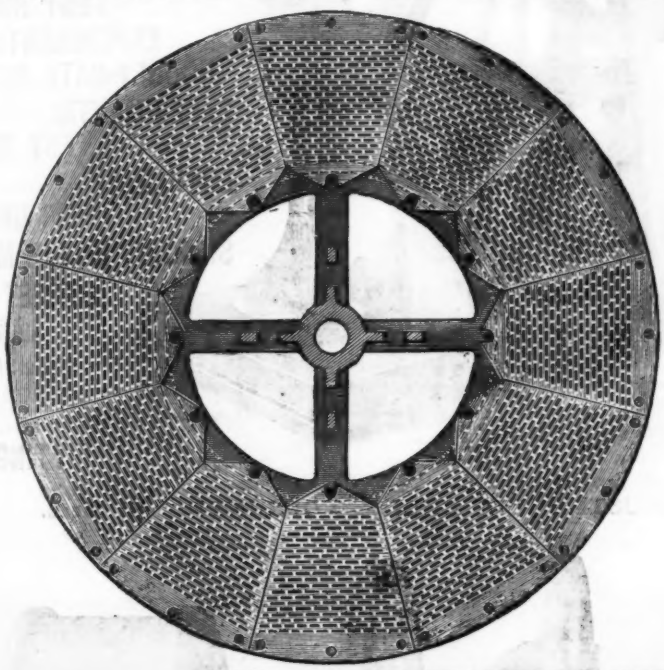

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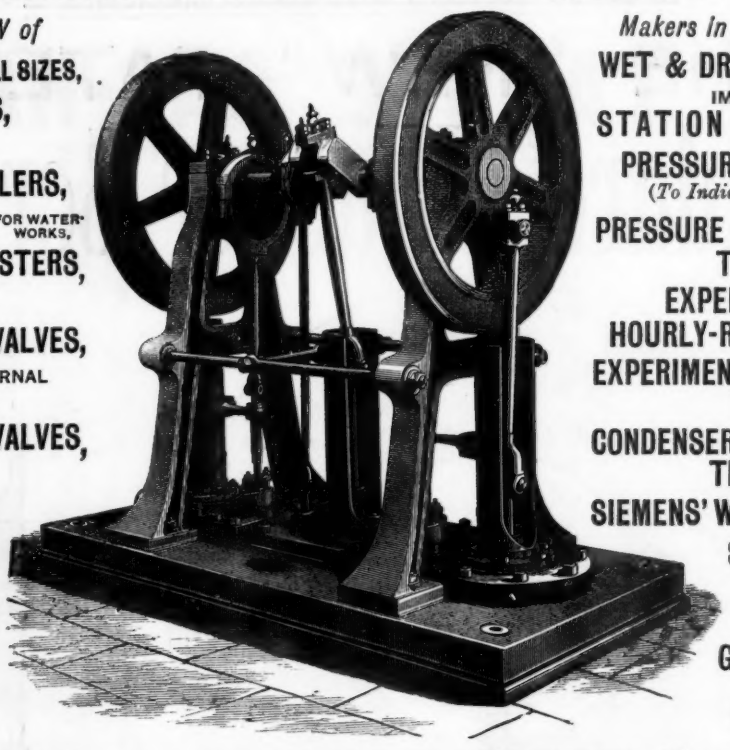

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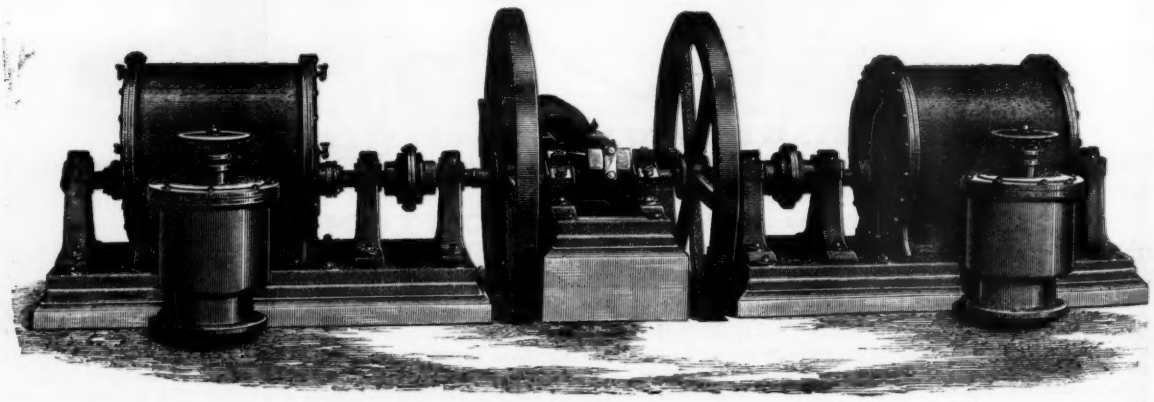

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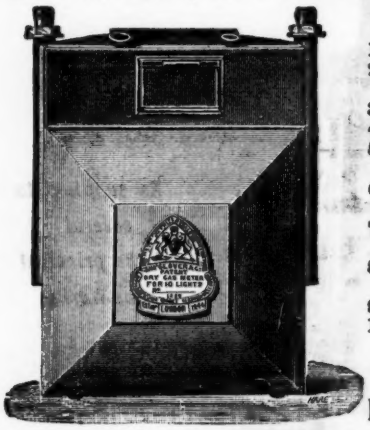

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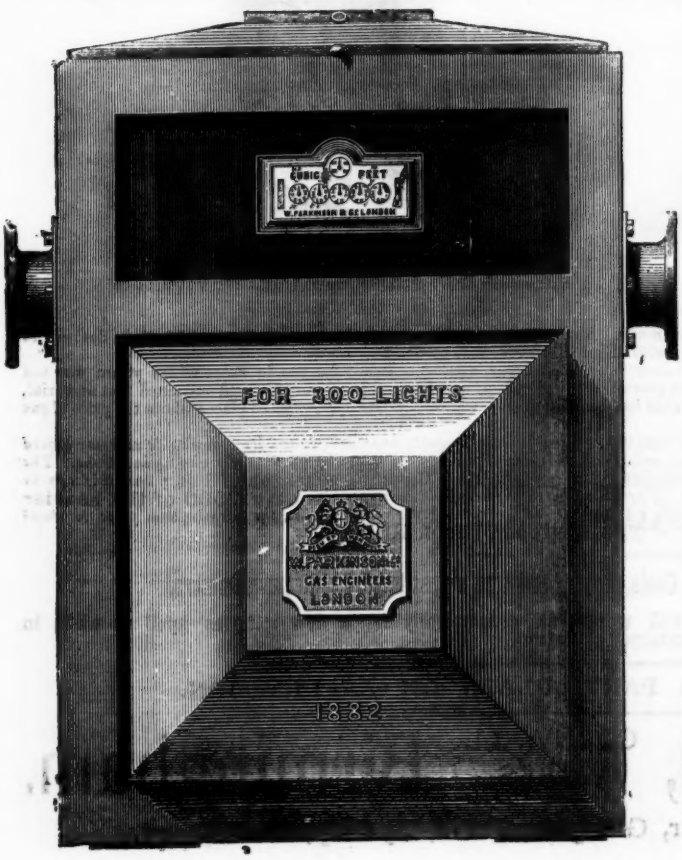

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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 9, 1889.

THE EIGHT-HOUR MOVEMENT IN LONDON.

THE negotiations mentioned in last week's JOURNAL as then in progress between the Engineers and the stokers in the employment of the South Metropolitan Gas Company were brought to a satisfactory conclusion on Friday, when the retort-house men at all the stations of the Company accepted the offer of the Board upon the basis of an eight-hour shift at current wages. The kindly way in which the Directors and Engineers talked with the men at the recent interview, and the unanswerable reminders given on that occasion of the advantages enjoyed by the Company's weekly servants under the enlightened rule of the Board, seem to have produced a proper impression on the stokers; and they therefore made up their minds promptly, without taking any further counsel with the demagogues who have tried to embitter the question. The settlement has been brought about through the tact of the Chief Engineer (Mr. Frank Livesey) and his assistants, the Engineers of the various stations, and the good will of the men themselves. It has been a difficult and delicate business, in the course of which any want of discretion on the one side or unreasonableness on the other would certainly have precipitated a crisis that would not have been terminated without trouble to the Company and loss to the men. The position taken up by the Board was unmistakeable, however; and the men easily saw where their advantage lay. That they should have chosen the eight-hour shift and 80 mouthpieces for a three-handed gang, as offered by the Directors, in preference to the continuance of the twelve-hour shifts and higher pay, is creditable to the sincerity of their demand for easier labour and longer leisure outside the works. We had expected that the choice would have fallen upon the other alternative, mainly because the chance of adopting the eight-hour system offered to the men two years ago was not taken. There seems to be some doubt, however, as to the extent to which a knowledge of this offer was spread among the men, and consequently the evidence is not altogether unimpeachable.

The terms upon which the men finally agreed with their officers differ very slightly from those published last week; two small concessions having been voluntarily made by the Directors. One is the abandonment of the stipulation for a month's notice to leave or change the system of labour, and the return to the customary weekly notice. The other is an addition of 1d. to the daily pay of the scoop-drivers; making it 5s. 7d. instead of 5s. 6d. These men receive 5s. 6½d. at present; and it was thought better to give another ½d. instead of taking as much off. With these unimportant modifications, the terms of the engagements of all retort men will henceforth be as stated in our last issue. The example of this settlement is likely to spread. The men in the employ of the Crystal Palace District Gas Company have been stirred up to make the demand for eight-hour shifts in the now stereotyped terms. But the Board has notified to them, through Mr. Gandon, that the South Metropolitan terms will be extended to Sydenham; and these will doubtless be accepted. The dispute between The Gaslight and Coke Company and their stokers is not yet quite settled; but it probably will be ended in a few days. We learn from a public source that it is Nine Elms which stops the way, and that the Beckton men refuse to be pacified until the work is equalized at all the stations. At twelve out of the Company's thirteen stations the system is now eight hours and 72 mouthpieces—not "per hour," as a newspaper report has it—instead of twelve-hour shifts and 84 retorts. It is an undeniable gain of time to the men; and it can only be hoped that they will make good use of it.

Of course, a greatly increased winter staff will be required by the Companies in consequence of this change; and a number of the present winter hands will come into permanent employ, which will be a considerable advantage to them. It is obvious, indeed, that the gain in the matter of wages will be wholly for the actual and the prospective winter hands. It is not, perhaps, an altogether desirable thing to open winter work only to a shifting labouring population; but this cannot be helped in connection with gas making. It is a compensation that gas-works require extra labour in the winter season, when many other occupations for unskilled hands are at their least activity. We cannot conclude our notice of the termination of what might easily have grown into a serious labour trouble without recognizing the practical good sense with which, on the whole, the demands of the men and the concessions of the employers have been made. As a matter of course, there has been on the men's side an unnecessary amount of brass-band business; but bands, brakes, and banners are the conventionalities of labour agitations. In point of fact, they constitute the principal portion of the stage properties, by the aid of which that ill-defined creature Public Opinion is to be properly impressed. On the present occasion the outlay upon these luxuries of the agitator has been so much money wasted; for the men with whom the stokers had in the end to deal did not pay the least regard to these things. A procession with bands and banners may impress a political minister; but a captain of industry does not require to have his attention

attracted in this fashion to the requests of his workpeople. It may amuse some of the men; but the expense must be greatly in excess of the enjoyment. As to the conduct of the employers in the recent emergency, it appears to have been admirable throughout. They did not act in the foolish manner of many coal-owners a short time since, who loudly declared that they never would or could afford their men an advance of pay; and ended by giving in one after another—thus losing both money and dignity. The attitude of the London Gas Engineers has been the exact opposite of this. They first made themselves acquainted with what the men asked for, and then recommended their Boards to offer reasonable concessions, which recommendations were in all cases received with good will, and a suitable policy formulated. If the altered system of retort-house working in London really tends to the amelioration of the lot of the stoker, who nine times out of ten is a good, hard-working fellow, nobody will begrudge the additional cost of the fresh arrangement. We understand that the new system was started throughout the South Metropolitan Company's works on Sunday evening.

THE LONDON COAL DUES.

The past week has been marked with much excitement in Parliament respecting the London Coal Dues, which would have lapsed last Friday but for the report of the Committee appointed to inquire into the rights of the City Corporation in the matter, and the action taken by the Government. Particulars of the proceedings will be found elsewhere. It was ascertained that, although the so-called rights of the Corporation were as shadowy as we described them last week, there was the undeniable fact that the City had, upon the faith of them, incurred a heavy responsibility in connection with the Holborn Valley improvement scheme which is not yet discharged. Consequently, by way of compensation, Parliament has permitted the continuance of the fourpenny duty for another year. Notwithstanding the determined opposition of a party in the House of Commons, who seemed disposed to carry to the point of pedantry, not to say animosity, their objection to the continuation of the dues, a large majority agreed in the view that the course recommended by the Committee was a fair compromise; and the matter has therefore been settled upon the lines specified. The result must be accepted as a proof that the last remnant of the dues will be wiped away at the time stated; no revival of the question of principle being possible. Thus ends one of the most practical questions of London administrative politics that has arisen during the present Parliament. The County Council have done well to cut themselves free from the seductions of a possible source of indirect revenue; and the City will be all the better for the deprivation which it has resisted so strenuously and with so little credit. For many reasons, it would have been preferable if the dues had been abrogated altogether at one blow; but it would be idle to regret the course that events have taken. Complete deliverance is, after all, only delayed for a year; and seeing how long the impost has endured, the consumers of coal may reasonably be asked to rest content with the prospect of gradual instead of sudden emancipation.

GAS AFFAIRS IN DUBLIN.

There are three matters to be recorded this week in connection with the gas affairs of Dublin. First, Major Marindin has reported adversely to the proposal of the Alliance and Dublin Consumers' Gas Company with regard to electric lighting. Major Marindin finds that the Company have not enough capital, even on their own showing, available for the purpose contemplated; and if their claim to power to break up the streets for the laying of electric wires were granted, it would place them in a far better position than any electric lighting company in the kingdom can hope to occupy under the Electric Lighting Act. Major Marindin remarks that he cannot believe this state of things to be agreeable to the views of Parliament or the Board of Trade; and therefore he recommends the Board not to accede to the Gas Company's request. This official condemnation, we hope and believe, will put a final stop to the ill-advised longing of the Company after a business that is not only outside their sphere, but is moreover a losing venture. Next, it is reported that when the suit of the Company against the Corporation for the recovery of the overdue rental for the public lighting was again brought before the Court, Counsel for the defendants announced that an arbitration had been agreed upon with reference to the various matters at issue between the parties. The Arbitrator nominated by the Company is Mr. H. E. Jones, Engineer of the Commercial Gas Company; and Mr. A. Vernon Harcourt has been chosen by the Corporation. An Umpire will be appointed by the Arbitrators; but their selection, if made, has not transpired. The points specifically referred to the Arbitrators to determine are three in number, and comprise the determination of the amount of gas supplied, its illuminating power, and various questions concerning the condition of the street lamps. The remark of the Judge when he learnt of the proposed reference was that he "hoped "there would be no more litigation;" and the comment was not the least sensible extra-judicial utterance ever made from the Bench. Lastly, Mr. Dennehy means to bring the Street Lighting Committee to book respecting the vagaries mentioned in the Journal last week; showing the Council their liability for the security of the streets, and reminding them of the risk they run if they allow the Lighting Committee to play with the lamps at will. A new meter-testing station is to be erected, at a cost to the city of £3000. Altogether, it must be allowed that gas matters occupy a good proportion of the time of the Dublin Town Council, as well as bulk largely in the local newspapers. We are not without hope, however, that existing difficulties are moving towards a settlement; but how long it may be before fresh ones arise, it would be impossible to say.

MR. ELLIS LEVER AND THE MANCHESTER GAS COMMITTEE.

As will be seen from a report in another column, Mr. Ellis Lever has been "at it again." The expression, albeit somewhat colloquial and deficient in literary precision, sufficiently represents the nature of the performance to any reader who has followed the history of Mr. Lever's dealings with Gas Committees of Corporations during the last few years. This time the scene of action is Manchester—once the place where Mr. Lever had his happiest hunting-ground. Now the circumstances have changed; and Mr. Lever no longer points to Manchester as the example of all that is great and good in the matter of purchasing coals for gas making. Feeling himself put in the shade by the Manchester Gas Committee, Mr. Lever has had recourse to an old device of his. He wrote to the Mayor a letter marked "Private," conveying, as is reported, reflections upon the action of the Committee in the matter of letting their last coal contracts. His Worship happening to be from home, this communication, or rather a copy of it, found its way to the hands of Alderman Sir John Harwood, ex-Mayor, and practically Chairman of the Committee, who is the last man to submit tamely to imputations from Mr. Lever or anybody else. Sir John immediately proceeded to deal with the matter trenchantly; whereupon Mr. Lever, becoming alarmed, wished to "withdraw his "letter," after the fashion which can only be properly described as Leverish. Sir John is not to be made a fool of in any such way, however; and the matter has been made public—at the last meeting of the City Council—with the result that Mr. Lever is challenged to substantiate his charges or take the consequences of ulterior proceedings. This appears to be the proper way of dealing with such a statement; it is not sufficient to call upon Mr. Lever to "substantiate or with-"draw." If there is anything wrong with the Manchester Gas Committee, of the nature that the present incident would seem to imply, by all means let it be brought to light. If not, it is high time that Mr. Lever, who, in his assumed character of Apostle of Commercial Purity, has seen fit to call the actions of the Committee into the question, should be taught that he cannot do this sort of thing with impunity everywhere. Local public opinion has been so much disturbed within the last few years with regard to the actions of Corporation Gas Committees, that Manchester cannot rest under suspicion. Sir John Harwood owes it to himself, to his Committee, and to the public to follow this matter up to the end, whatever may be the consequences.

THE LOOMIS FUEL-GAS PROCESS.

A short time since we had occasion to reproduce some statements relating to the results of the Loomis fuel-gas process, which appeared originally in the pages of our American contemporary *Light, Heat, and Power*. The credibility of this report was sorely damaged by the criticism of Mr. Denny Lane; and it is perhaps in reply to this exposure of the loose way in which figures are handled by partizans of fuel gas that the same periodical has recently published an illustration and descriptive account of the Loomis gas plant erected at the works of the Waltham Watch Company. Of course, our contemporary does not mention Mr. Lane's criticism in any direct fashion: but there are sundry vague and involved references to the refutation of theory by fact, and

suggestions of what happens "when theory blows its thin "air against the stone wall of fact." This catastrophe, we are led to infer, frequently happens in America, especially when the performance of the Loomis gas-producers is in question. The generator-room at the Waltham Watch-Works appears from the drawing to be a fairly equipped place. The gas produced here is used for firing boilers and for melting and tempering metals. It is reported to be a success; indeed, the testimonials from mechanics employed in the watch factory are only too good, for one man declares that he can melt in 30 minutes, with the fuel gas, metal that took an hour and a half to melt with coal gas—comparative quantities not stated There is a very suspicious absence of figures from these reports from Waltham; and nobody of greater authority than a "master mechanic"—whatever this grade may be—has a word to say about it. We get figures, however, in a letter from the Treasurer of the John Russell Cutlery Company, of Turners Falls, Mass. (Mr. R. N. Oakman, jun., who addressed one on the subject to us a few weeks since), who asserts that the Loomis process of gasifying bituminous slack has been at work in this factory for two years, to the great satisfaction of the Company. The same generators make water gas for forging, &c,, and generator gas for boiler firing. It is stated that the Company have "obtained in generator "gas, burnt under boilers, over 75 per cent. of the value of "the coal consumed in generators (compared with coal burnt "under boilers), and in addition thereto 45,000 cubic "feet of water gas per ton of slack. It is evident that "with generator gas, properly fired, the fuel value of the coal "consumed in generators may be obtained, and in addition "thereto as much as 40,000 cubic feet of water gas per "ton. By test we have made from 3484 lbs. of bituminous "slack 76,397 cubic feet of water gas." It will be noticed that these figures, while apparently definite, are really most elusive, and the "facts" against which "theory" is supposed to dash in vain are no more precise than those of the famous cook's recipe which prescribed "a piece of butter "about the size of a piece of chalk." We have taken particular notice of the Loomis gas-generating process from the moment we first heard of it, simply on account of its pretension to use bituminous slack as the raw material for water and generator gas. It is time, however, that some reputable engineer or chemist, not identified with the proprietors, should tell us exactly how much gas the process will give for a stated weight of raw material, in figures capable of being checked in the ordinary way. At the risk of being dubbed "theorists," we respectfully urge upon our American friends interested in the Loomis process that all gases have weight, and, when combustible, a calorific value determinable by simple experiment. These are data of which projectors of new processes seem remarkably shy; but as there is no mystery about either the specific gravity or the calorific value of coal gas, so there must be none about the corresponding elements of any gas comparable with it.

THE REVISED RAILWAY RATES FOR COAL.—We learn from Mr. J. Deakes, of Worcester, that the Gas Committee of the Birmingham Corporation proposed deciding, at their meeting yesterday afternoon, what steps they would take in connection with the movement now on foot against the proposed abolition by the railway companies of the rebate on gas coal. He states that considerable support has been promised by gas companies and gas-supplying corporations; and that the principal colliery-owners of Yorkshire and Derbyshire are combining to resist the action of the railway companies.

MADAME ALTING-MEES AND HER GAS COOKERY LECTURES.—The Directors of The Gaslight and Coke Company have made arrangements for the delivery of a series of lectures on cooking by gas at various suitable centres in their district during the present season; and have secured the co-operation of Madame Alting-Mees in carrying out their project. The first of the series of lectures will be commenced in the Victoria Hall, Archer Street, Bayswater, this evening, and be continued till Friday. Next week a similar course will be given in the Town Hall, Kensington; to be followed by others in the Chelsea Town Hall, and in St. Andrew's Hall, Newman Street, Oxford Street. These are the arrangements so far settled. The Directors must be congratulated on being able to secure the services of Madame Alting-Mees, who has lately concluded a very successful series of cookery lectures in the Gas Pavilion at the Paris Exhibition, which were on each occasion attended by large audiences, who not only filled the lecture-hall, but also the adjoining grill-room. If the lectures now commenced in the Metropolis are not equally successful, it will be owing to lack of appreciation on the part of those for whose benefit they are intended, rather than to the inability of the lecturer to make her subject attractive.

Water and Sanitary Affairs.

THE latest phase of the London Water Question, as presented in Parliament, is the introduction by Mr. O. V. Morgan of a Bill to enable the London County Council to purchase the rights of existing Water Companies in the Metropolis. The way has been prepared for this measure by the withdrawal of the Bill previously introduced by the same gentleman, whereby it was proposed not only to give the County Council power to purchase the rights of the Water Companies, but also to introduce new supplies—thus placing the Council in a position to menace the Companies with a competing undertaking. This part of the scheme has been dropped. But competition may be introduced in another form, as suggested by the omission of the definite article before the words "existing "Companies." One area may be employed to fight the rest; the Council showing how clever they could be in some selected part of the Metropolis. In addition to Mr. O. V. Morgan's Bill, there is one by Mr. Firth, which is intended to confer power upon the County Council to spend money in instituting inquiries relating to the London Water Supply. This measure is to receive the support of all the members of the County Council who are members of Parliament. Mr. Firth also has the credit of obtaining a parliamentary return—ordered eleven months ago, but only issued last Saturday—giving a number of details with regard to the water supply of twenty-one cities and boroughs in the United Kingdom. Possibly Mr. Firth thinks by comparison to show that these particular places are more advantageously served than the Metropolis. Some portions of the return relate to Corporations, and others to Companies. Into the maze of statistics thus furnished, we may perhaps plunge at some future time; for the present, it may suffice to refer to the amount of the supply given per day for domestic use in the specified towns. London is not included in this return; but, as a starting-point, we may mention that the daily domestic supply in the Metropolis exceeds 24 gallons per head, and the total for all purposes exceeds 30 gallons. Looking down Mr. Firth's list, we find the domestic supply in Bradford to be under 21 gallons per head; in Bolton, under 20; in Leeds, 19; in Bristol, 17; in Liverpool, 13½; in Manchester and Huddersfield, 13; in Nottingham, a little over 12; while in Oldham, the Corporation are credited with supplying as little as 8 gallons per head daily for domestic purposes, though this appears to be a mistake. In speaking of the price at which water is supplied, consideration should obviously be given to the quantity, and that which seems to be cheap may thus turn out to be dear. We wonder what would be said in London if the Companies were to cut down the domestic supply to the proportion recorded at the greater number of the towns included in this return. We cannot find an English town out of the 16 on the list with a domestic supply equal to that of London, except it be Preston, where the daily domestic supply is 25 gallons per head. Edinburgh, Glasgow, and Dublin appear to exceed London; but Belfasthas only 18 gallons per head for domestic purposes. Dundee cannot give their figure. An investigation of the death-rate might perhaps follow with advantage; and materials for this purpose are given in the return. But when Mr. Firth has marshalled all his figures, and manœuvred them at his will, what is to follow? Is London prepared to place its enormous water supply at the disposal of a body only a few months old? This is not a matter to be transferred, cut-and-dried, from the Metropolitan Board. In respect to other matters, the Council has simply stepped into shoes already worn. The water supply would be in the nature of an experiment, placed in untried hands. The Council might seek to retain the existing staff of the Companies; but we presume it will not retain the Directors, by whom the machine has hitherto been controlled.

The case of *M'Colla v. The Clacton Gas and Water Company*, reported in the last issue of the JOURNAL, illustrates the kind of attempt which is sometimes made by water consumers to coerce a Company by methods which the law does not sanction. The plaintiff in the action referred to required the defendant Company to supply his premises with water. A dispute arose, and the water was turned off. Finding it difficult or inconvenient, to invoke the aid of two local Justices to adjust the dispute in the manner provided by the Water-Works Clauses Act, 1847, the plaintiff hurried up to London, and applied for an injunction to restrain the Company from continuing to keep the water supply cut off from his premises. The injunction appears to have been granted by consent of

the Company, and without prejudice to their rights. But the parties managed to come to terms after all; and the only direct point remaining to be decided by the Court was, who should pay the costs of the Chancery proceedings plaintiff had so needlessly embarked upon. In order, however, to decide this question, it was necessary to consider a very important point as to the remedy of a consumer against a Water Company under similar circumstances. It is, of course, well known that section 43 of the Water-Works Clauses Act, 1847, imposes a penalty on any Company failing or neglecting to fulfil their duty with regard to the supply of water. The plaintiff, it is true, sought to put his action on other grounds than such failure; but substantially the point involved was that which we have stated. Some years ago it was decided, in *Atkinson v. The Newcastle and Gateshead Water Company*, that where a statutory remedy had been provided, it was not open to an aggrieved consumer to bring an action for damages instead of resorting to such statutory remedy. In that case, the plaintiff alleged a failure on the part of the Company to keep their water-pipes duly charged with water, in consequence of which default his timber-yard and saw-mills were destroyed by fire. The Court of First Instance decided in his favour; but this decision was reversed by the Court of Appeal, on the ground that it was highly improbable that the Company, when applying to Parliament for statutory powers, and entering into a bargain as to the conditions on which those powers should be granted, would knowingly have accepted as one of those conditions the liability of having to insure gratuitously against fire all buildings throughout the district of supply; and that it was equally improbable that Parliament would have imposed so unreasonable a condition. Certainly, there is nothing in the Water-Works Clauses Act to show that anything of the kind was contemplated by the Legislature; and though it is true that the action against the Clacton Company was not brought for the recovery of damages, there was, we conceive, no principle involved which can be distinguished from that laid down in the older case. Mr. Justice Stirling, at any rate, felt that Mr. M'Colla's action was governed by that case; and held without hesitation that it was no part of the scheme of the Water-Works Clauses Act to create any duty which could be made the subject of an action at the suit of individuals. The aim of the Legislature has been to impose penalties not so much for the purpose of compensating individuals, but rather as a security to the public for the due discharge of a specified statutory duty. It there fore becomes clearer than ever that, in every dispute of this character, either party can only have recourse to the tribunal provided by the Act of 1847. The case of *Hayward v. The East London Water-Works Company*, decided in 1884, though not cited in the recently reported action, has some bearing on that and similar cases. Mr. Hayward was the lessee of 150 houses let to weekly tenants, and, relying on the decision in the Dobbs case, he tendered to the East London Company a lower rate than that which they considered themselves entitled to demand. The Company therefore cut off the water supply to Mr. Hayward's houses; and that gentleman then obtained from Mr. Justice Chitty an interim injunction restraining the Company from continuing to deprive him of water. Upon argument as to whether or not the interim injunction should be continued, reference was made to section 68 of the Water-Works Clauses Act, 1847, which provides the statutory tribunal of two Justices for the determination of such disputes; and the Judge, having heard the arguments of Counsel, came to the conclusion that the injunction should only be continued upon the plaintiff giving an undertaking to bring the dispute forthwith before the Justices, in the manner provided by the Act. It was further laid down that it was the plaintiff's duty, and not the Company's, to initiate such proceedings. Mr. Hayward, however, refused to give the undertaking required by the Court; and the motion for continuing the injunction was therefore dismissed with costs. In view of these decisions, it must be taken that the law upon this important subject is perfectly well settled.

In our last issue we published a letter containing some remarkable statements with respect to the supply of water to Plymouth and certain outlying districts which are within the area of supply of the Plymouth Corporation. In the absence of further explanation, it would certainly appear that the Corporation have adopted a dog-in-the-manger policy of which the Plymouth Dock Water Company (otherwise known as the Devonport Water Company) may very reasonably complain. In 1867 the Plymouth Corporation obtained a Special Act empowering them to supply water to numerous outlying districts, subject to the condition that such districts were not to be served to the prejudice or injury of a proper supply within the borough of Plymouth itself. It is alleged, as a matter of fact, that although the Plymouth Corporation are now serving certain districts outside the limits of the borough, the borough itself is not obtaining a constant supply of water, while in one outlying parish the Corporation, though authorized to supply water, have failed as yet to do so. It is here that the dog-in-the-manger policy has been too successfully adopted; for the borough authorities opposed the Bill by which the Devonport Company sought power to supply water for all purposes to the parish in question—alleging that the Corporation could and would provide the requisite supply. This statement appears to have been accepted as correct by a Committee of the House of Lords; and, in consequence, the Bill of the Devonport Company failed to pass in the form in which it was submitted. In the meantime, Plymouth is suffering from lack of water, and the particular parish which has been and is the bone of contention can only obtain it from wells which have been emphatically condemned by a competent authority. The question thus involved is a very serious one, and, indeed, is part of a much larger subject which will some day have to be dealt with by the Legislature. Under the provisions of the Public Health Act, 1875, apart from any special enactment, a local authority for the time being supplying water within their own district may, with the sanction of the Local Government Board, supply water to the local authority of any adjoining district. It is by no means easy to define the meaning of the words "adjoining "district;" but whatever may be the interpretation to be placed upon the term, it is always a condition of any contract to supply an outside district that the wants of the district proper must be first provided for. Nor until that has been done can the local authority be entitled to treat any of their stock of water as surplus, and dispose of it outside their proper area.

The Association of Municipal and Sanitary Engineers and Surveyors, of which Mr. H. P. Boulnois, M. Inst. C.E., the Borough Engineer of Portsmouth, is the President, concluded last Saturday a meeting they had been holding at Portsmouth, by paying a visit to the springs at Havant whence the water supply of the borough is obtained.

Referring to the account which appeared in the Journal last week of the opening of the sewage works at Kingston-on-Thames, it should have been mentioned that the contractor for the whole of the works was Mr. W. Cunliffe, of Dorking. The engines, boilers, and pumps were supplied to him by Messrs. Willans and Robinson, of Thames Ditton; and the filter-presses and drying-cylinders by Messrs. Holroyd, Horsfield, and Wilson, of Leeds.

In a paragraph headed "Electricity on Draught," our contemporary *Money* last Saturday said:—"House-to-House Electrical Supply Companies and other similar concerns with different titles are springing up with mushroom rapidity all over the country. In a number of cases the capital is monotonously alike, and at first blush they all look a very fine thing for—the Directors. It would need a fairly lengthy article to criticize their merits or demerits; so we content ourselves at present by strongly advising investors to be on the alert, and as the electricity tap has been turned on, to be careful that they themselves are not too rapidly tapped."

As another example of the attempt to conduct gas undertakings by information obtained by inquiry circulars, to which we have on several occasions had to call attention, may be cited the following list of questions which have been sent out by the Chairman of the Leeds Gas Committee with a request for an early reply:—"What number of meters have you in use? What number of meter inspectors have you? What number of meters do they inspect per day on ordinary watering inspections, and what number per day when stock taking? What percentage of your meters fixed are dry? Are your accounts sent out quarterly or half yearly, and do meter inspectors take any part in the delivery of such accounts? Have they any other duties; if so, kindly define them? What are their weekly wages?"

In an article which appears elsewhere, the results are recorded of a recent sale by Messrs. Fox and Bousfield of certain fractional parts of King's and Adventurer's shares in the New River Company. We learn that this firm will on the 17th inst. occupy the unprecedented position, in connection with the sale of this important water stock, of being able to offer, in one lot, an entire Adventurer's share in the Company. No whole share has ever been offered for sale before; so that the proceedings at this auction will be of unusual interest. The last sale of a part of a share was at a rate equal to about £100,000 per whole share. As the actual dividend on an Adventurer's share for 1888 was only £2610, it is evident that buyers have a high opinion of the value of the reversion to future accretions of profit to which these shares are entitled. The fact that the possession of a share qualifies for a seat on the Board of the Company, no doubt, helps to raise its price. In 1727 a King's share was worth £5000; in 1838, £38,000 was paid. The price has since more than doubled, and what was sold at about £85,000 last year is now worth £100,000.

The Gas Institute.

PROCEEDINGS AT THE TWENTY-SIXTH ANNUAL MEETING.

GEORGE GARNETT, Esq., M. Inst. C.E., PRESIDENT.

PAPERS AND DISCUSSIONS.

(*Continued from p. 53.*)

RETORT-SETTINGS AND THE PIPE APPENDAGES CONNECTING THEREWITH.

By GEORGE ANDERSON.

The object of the present paper is to describe to you a system of retort-setting for which I applied for letters patent on the 18th of June, 1881—just eight years ago. I had tried them at one of my works the year before; and I have worked them ever since. I consider they are worthy of your attention; and am prepared to answer any reasonable question concerning them, and shall be glad to assist any of you who approve, to adopt them without much attention to royalty.

Before I describe the drawings, I will lay before you certain general principles in which I differ from some engineers. This should furnish you with grounds for criticism.

I think it is bad to put a deep charge of coal into a retort (sometimes 10 or 12 inches in thickness) such as is put into retorts that are 16 or 18 inches in diameter or height inside, because—

(*a*) The coal is caked on the exterior for some hours before the interior of the charge is worked off.

(*b*) The whole of the outer surface of the charge is giving off sulphur from the coke for some hours after it has given off its gas; and this sulphur has to be extracted from the gas by the purifiers.

(*c*) So large a mass of coal cools the retort below the best temperature for making gas for a considerable time in each charge, at which time I know that tarry vapours, and not permanent gas, will be formed in a larger proportion than at a later period of the charge when the retort has recovered the heat it lost by the introduction of the fresh charge. This fact was known to the late George Lowe, who more than 40 years ago invented his reciprocating retort, where, by the use of valves on the ascension-pipes, he caused the gas from the newly-charged retort to pass through a retort half worked off before it got to the hydraulic main.

Then, as a matter of economy in fuel, the late Colonel Croll—whose assistant I was during ten years of the most eventful period of his very active life—heated cast-iron retorts by the heat passing from clay retorts. This system I adopt wherever I can.

Holding these views, I was spending a week or two on the top of a Swiss mountain one summer shortly after there had appeared in the JOURNAL OF GAS LIGHTING letters impugning the veracity of the analysis of coal we received from coal proprietors, because such good results are never obtained in practice. I thought that it was more likely that there was something wrong with us gas managers than that experimental chemists were continually telling lies. So, in the beautiful solitude of the mountain, I began considering wherein did our practice differ from that of a laboratory experiment; and concluded that the chief difference lay in the size of the charge, its less sectional area, and the more equal temperature of the retort throughout the whole period of the experiment. I then decided to erect some retorts at one of my own works, as close to what was practicable on a manufacturing scale as possible.

I also had some other points floating in my mind for some time, which I also included in my new construction. One of these was a twin retort; another was a dumb plate in the front of the furnace, containing water, on the principle of the tuyre of a hot blast furnace; a third was a non-dip pipe in the hydraulic main, about which much was, about that time, being written in the gas journals. I had thought of adopting non-dip pipes 20 years before, having erecting a bench of nine arches of retorts at the Rotherhithe Gas-Works in 1853-4, with the dip-pipes prepared to receive a ball-valve, which, however, I did not put in, for I was not at the moment circumstanced to try experiments, and I left the management next year, and I suppose no one knew anything about it. Another thing was to deliver the gas from the hydraulic main into a foul main on top of the retort-benches, to more gradually cool the gas before it passed to the foul main attached to the interior of the wall of the retort-house.

In carrying out this experiment, I built three arches much the same as those shown by the drawings—with this difference, that I put only three retorts in the centre arch, which has no furnace, instead of the six retorts shown on the drawing. I may remark, in passing, that I abandoned the three retorts in the centre arch after this experiment, for the two cast-iron retorts in it got too hot and only lasted one year, since which they have been erected as you now see them; all the arches or ovens being of the same width.

In the experiment alluded to, the retorts were only 15 inches wide by 12 inches high in cross section and 9 feet long, and were charged with about 1¼ to 1½ cwt. of coal every three to four hours. The "twins" worked off in three hours, the "ones" over them in three-and-a-half to four hours, and the "irons" in two-and-a-half hours. Of course, the charges could have been regulated to make them come off better together; but I give you the facts, for I am now to give you the results carefully taken by one of my sons, whom I told off to note accurately what occurred. Here is so much of his report as it is necessary to give:—

Number of Retorts in three Arches, 13.

	First Experiment. Three Days' Working.	Second Experiment. Three Days' Working.
Coal used	16 tons 2 cwt.	14 tons 7 cwt.
Gas produced	182,200 cubic feet.	162,900 cubic feet.
Tar—		
Hydraulic main	29 galls.	32 galls.
Horizontal pipe	23 galls.	31 galls.
Condenser	149 galls.	120 galls.
	201 galls.	183 galls.
	Averages per Ton.	Averages per Ton.
Gas	11,317 cubic feet.	11,352 cubic feet.
Tar	12·6 galls.	12·75 galls.

Illuminating Power.

Mean of 27 Observations.	Mean of 27 Observations.
16·23 candles.	15·30 candles.

Gas per Retort per 24 hours.

4673 cubic feet.	4177 cubic feet.

Gas per Furnace per 24 hours.

30,366 cubic feet.	27,150 cubic feet.

Gas per foot run of Retort-House per 24 hours.

4583 cubic feet.	4098 cubic feet.

(Allowing 9 inches at each end beyond the daylight of the arches.)

Of the quantity of coke made there was used as fuel in the first experiment 32 per cent., and in the second, 28; but reckoning a ton of coal to produce a chaldron of coke, the fuel account was 24 per cent.

On the results, which were only made for my own information eight years ago (and not with a view to publication), I have to notice—

1. The work was all new and in good order.

2. The men had not got thoroughly acquainted with the system; for instance, for the first three days 5 tons of coke were debited against the fuel; in the next three days only 4 tons. In the meantime they had reduced the temperature of the retorts, especially in the centre setting, where the iron retorts were, which showed signs of collapsing, and did collapse before the year was out.

3. The fuel account was small considering there were only two furnaces in action.

4. The make of gas per retort was large considering the smallness of the retorts.

5. The make of gas per ton of coal was large; the usual make on the works being 9800 to 10,000 cubic feet,

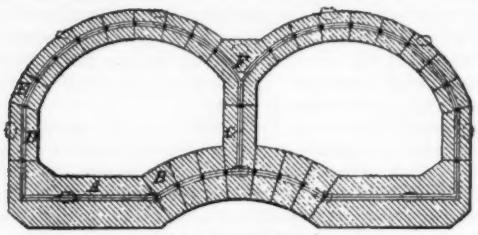
6. The make of tar was more than I expected, which leads me to think that it usually is more than we are in the habit of calculating.

While the experiments were in action, the whole of the gas was made by these retorts; rendering it unnecessary that allowances should be made outside them.

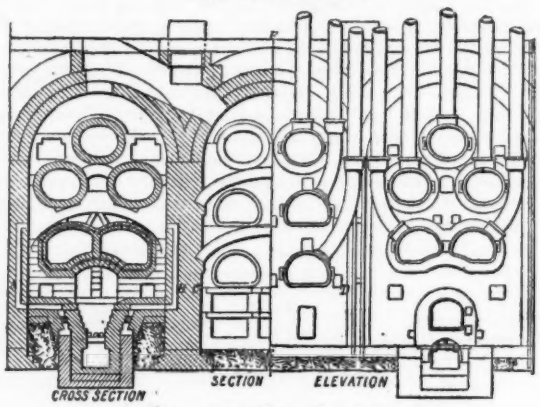
I come now to an explanation of the drawings on the walls, which represent the modifications made since the experiments I have described.

The Twin Brick Retort.—There is a half-size cross section of this on the wall. It consists of corner pieces A, 14 inches long; side tiles D, also 14 inches long; arch bricks B, which form the bottom; centre key of arch C, which also forms part of the centre division; a skew piece, which forms the remainder of the centre division; and arch bricks, E, which form the top of the retort. The position of the mouthpiece and the bolt-holes are shown by dotted lines.

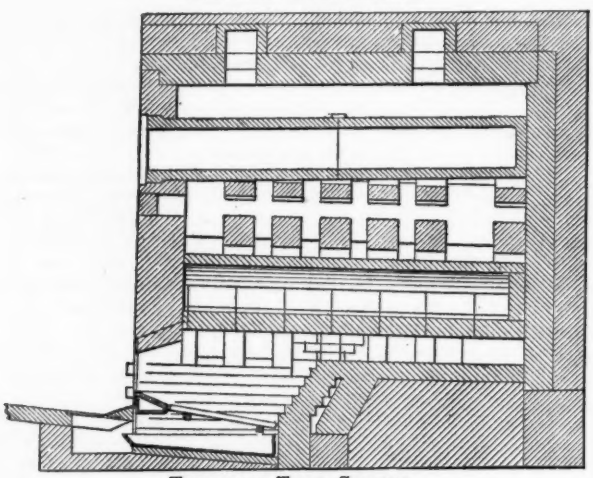
These retorts are each 18 inches wide by about 13 inches high, and rest on a series of pillars, 6 inches wide, on the face and 14 inches from centre to centre, which gives flue-holes between each 8 inches wide, through which the heat



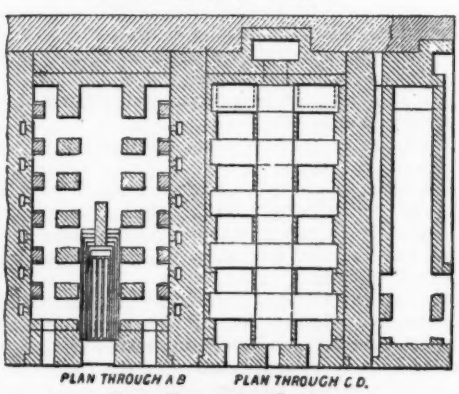
TWIN BRICK RETORT.



TRIPLICATE TWIN SETTING.

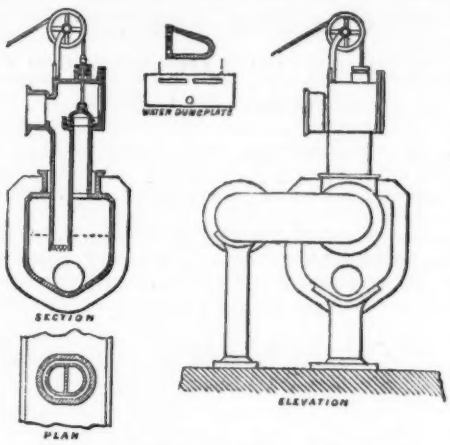


TRIPLICATE TWIN SETTING.



TWIN TRIPLICATE SETTING.

passes from the furnace. (See longitudinal section.) The twin retort is 9 inches narrower than the oven, and 4½-inch walls are built between the oven and the retort to support the sides of the latter—one wall opposite each joint in the side tiles. The furnace is of the usual form, with an air passage behind the sides, to help to keep the sides of the furnace from melting, and to deliver heated air into the oven, between the lower and middle retorts, for the purpose of combining with any carbonic oxide that may have passed up from the furnace and enflaming it there to heat the upper retorts. The two middle retorts rest on 9-inch rib arches; and the upper retort rests on the rib arches sprung against the two middle retorts.



ANTI-DIP PIPE (1-8TH SIZE OF DRAWING).

By this arrangement the bottom twin-retort can be renewed without disturbing the upper ones. The four lower retorts are set with a fall of 4 inches or more towards the back, to induce tar running down the ascension-pipe to flow into the retort. Only the top retorts in either setting are set level; and this merely for ease to the men in drawing and charging.

The heat passes from the furnace up the outsides of the twin-retort; through between the retorts above; and out through two flue-holes in the arch of the oven, as shown. Thence it is led from the oven on each side into the centre arch, which is set with two thin clay retorts at the top, with four cast-iron retorts beneath. These retorts are also rested on rib arches sprung from the sides of the oven—thus any two of the six can be replaced without disturbing the others. The heat from both the side ovens descends among the retorts in the centre oven (which is without a furnace), and finally enters under the lower iron retorts near the front. It then passes along under them, descends into a lower flue, and returns to the front again, where it splits right and left and enters a flue in the centre of the oven, still under the level of the iron retorts; then back and up a flue in the back wall of the setting, and thence to the main flue and chimney. Access is had from the front, by which any of these flues can be easily cleaned. The object of causing the heat to traverse these two last flues is to keep the inside of the oven hot while reducing the temperature of the gases, so that there may be the least waste heat passing up the chimney.

I now proceed to the working of the retorts. I charge, say, a left-hand twin and a right-hand oval in each setting as one draw. The next draw after an hour has elapsed is the other two. And after another hour I draw the tops—thus introducing a much smaller amount of cold coal at one time than if the retorts were all drawn at one draw, by which I retain a more equal temperature, which is better for gas-making, as well as for the duration of the retorts.

The next thing is the non-dip pipe. I neither advocate these nor condemn them; I think there is but little in them. We find that with them, unless we work with a slight pressure, we are apt to get stopped pipes. However, some advocate them; and there is a drawing on the wall one-fourth the full size of the kind I have used, which I know to be effective. The dip-pipe is double down to the top of the hydraulic main, where one leg is cut short, while the other descends to the usual depth below the surface of the liquid in the main. The short leg is fitted at the top with a ground seat and bell-valve, the lower portion of which dips into about an inch deep of tar to ensure it being gas-tight when down. The bell-valve is lifted and lowered by a rod passing through a stuffing-box; the rod being continued by a wire passing over the pulley above and down to the front of the retort-benches within reach of the stokers. This valve is open while the charge is in, and dropped on to its seat when the charge has to be drawn. When the retort is again charged, and the lid on, the gas will pass in the ordinary way for a few moments till the valve is again raised.

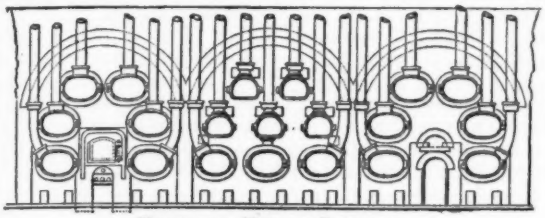
The hydraulic might be placed in its usual position over the front of the benches. But I prefer to place it towards the other end of the retorts; and instead of the ordinary H-pipe, I employ an open bend on the top of the ascension-pipe, make the latter much shorter than usual, and give the pipe to the main a good fall towards the retorts. I take the liquid off from the main near the bottom instead of at the

usual overflow level, by doing which I better ensure that all tar will be removed. This is more necessary where dip-pipes are used, so that the gas may not have to plunge through tar, which reduces its illuminating power. I show a foul main resting alongside the hydraulic main. The gas is passed through this before it passes to the condenser proper, in order that it may be gradually cooled.

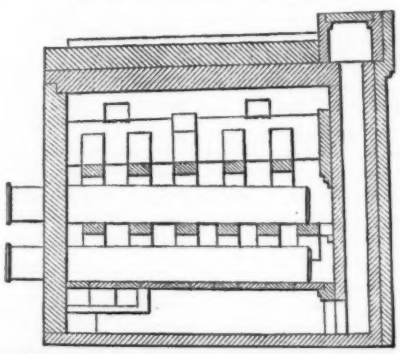
Regarding the dumb-plate I have referred to, instead of solid iron or fire lumps, I have used a box, as represented by the drawing on the wall. A stream of water is passed through it, equal to what the ash-pit requires. It has an overflow, represented by the long slit, from which the water drips into the ash-pit. This dumb-plate affords a better fulcrum for the clinkering bar. It cannot burn away so long as it is supplied with water; and thus the front of the furnace is less liable to that destruction which always follows the burning or breaking of the dumb-plate.

The working trials which I have referred to in the early part of this paper, were made with retorts constructed as I have now described.

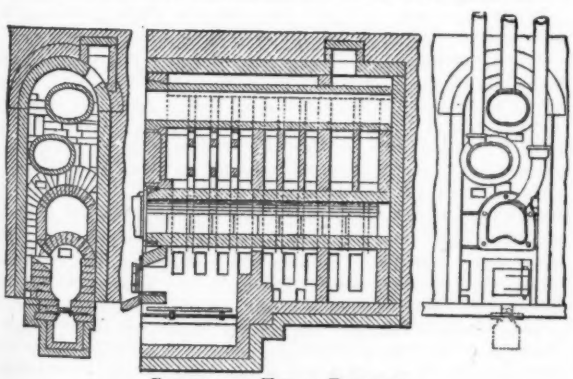
These retort-settings I do not propose for adoption in the largest class of gas-works. For such I employ settings, an elevation of which is on the walls, in which twenty retorts are set in three arches; the two outer ones only having furnaces. Neither do I propose them for works of a very small class. For these I employ a setting, a drawing of



TRIPLICATE RETORT-SETTING.



TRIPLICATE SETTING—LONGITUDINAL SECTION OF MIDDLE ARCH.



SETTING OF THREE RETORTS.

which is also on the walls. But I propose them as suitable for works from 2000 tons of coal and upwards; and one reason why I mention this is that I sometimes see large settings in small works, as if Birmingham or London were transferred to a village, where it is inconvenient to be lighting up or letting down a large number of retorts at a time.

I only produce the drawings last referred to in case any one should suppose that I recommend the retorts I have described for general adoption. I contend that there is no mode of setting retorts that can be adopted in works of every magnitude. The engineer must study his wants and adopt that which is most suitable under the circumstances. You will, therefore, please to consider that the drawings last referred to form no part of this paper, further than to illustrate the remarks that different-sized works require different modes of retort-settings.

To those of you who use none but clay retorts, I might give matter for discussion in more fully stating my reasons for using both clay and iron retorts. Up to 1849, I think there was scarcely a works in the South of England but used iron retorts solely, although clay retorts had been used in the North of England and in Scotland for ten to twenty years previously. Now, in 1889, clay retorts are as universal in the South as iron retorts were then. Consequently, I, who use both clay and iron retorts, am somewhat in conflict with the engineers of both periods. Clay retorts are much cheaper than iron ones in the first instance; they last longer than iron retorts then did, or would now if the iron retorts were placed over the fire as clay retorts are; and they can be worked at a higher heat, and are less liable to accidental destruction than iron retorts. These are all elements in their favour. Indeed, had the use of iron retorts been continued to the present day, gas would not have been sold so cheaply as it now is. I, therefore, say nothing against clay retorts beyond that they are bad absorbers of heat compared with iron retorts, and that heat which is insufficient to heat a clay retort will heat an iron one if placed immediately beyond it. I have found striking examples of this. For instance, when lighting up retorts, as shown in the drawing, where twenty retorts are heated in three arches, the centre one being without a furnace, we find that the five iron retorts are ready for charging sooner than the three thin clays, although the heat has passed from the latter to the former. Another instance: In some of my works, I place the steam-boiler on top of the main flue; and I find that I can raise more steam when I am working clay retorts alone than when I am working clay and iron retorts combined—proving that, in the latter case, less heat is passing to the chimney. These are inferential instances, but I also know the fact that I get a smaller fuel account in the settings where I place iron retorts to receive the last of the heat; and of all the settings I have tried, twenty retorts in three arches with two furnaces are the most economical.

I may be asked if I get as much gas out of the coal as we see quoted. My answer is, "No!" and that I am not an advocate of those very high results. I do not think they are good for the public or for the gas company. Towards the end of the charge gas comes off very slowly; and it is of very poor quality, and often requires a mixture of cannel coal to bring it up to the standard illuminating power, which deteriorates the quality of the coke. I am content if I get 10,000 cubic feet to the ton of best Newcastle coal as an average of the year. I know when we make an experiment we do get more; but I consider it would be unfair to tie a manager to experimental results.

Discussion.

Mr. W. A. VALON (Ramsgate) said Mr. Anderson was such a veteran carbonizer that it was almost impossible for anyone to ask any questions which had not already been treated. If, therefore, the paper were not fully discussed, it was because the subject had been so thoroughly thrashed out that it was difficult to find anything new to say. He understood, however, that Mr. Anderson's remarks referred especially to small works; and in that, he (Mr. Valon) thought, most would agree with the paper. He had never used iron retorts himself, either small or large; and without giving the reason, he might say he did not agree with Mr. Anderson there. The principle of heating clay and iron must depend on prolonged contact, because the heat must be conducted from the one setting to the other; and his experience in carbonizing was that contact with flame became an extravagant matter, and that all retorts ought as far as possible to be heated by direct radiation from the flame itself—not by heat conducted by contact from one part to another. As far as that was concerned, therefore, he should differ from Mr. Anderson as to the economy of heating by contact, instead of by radiation. Again he noticed that Mr. Anderson spoke of coke by measure and coal by weight; saying that a ton of coal produced a chaldron of coke. It would simplify matters if Mr. Anderson would kindly say that 20 cwt. of coal produced so many hundredweight of coke. Regarding the anti-dip pipe, as to which Mr. Anderson gave no opinion, he (Mr. Valon) had no objection to venture his own. He made an arrangement

himself some years ago with an anti-dip pipe which caused a large expense; and he abandoned it because he found that a light seal was quite as good as any anti-dip pipe. He did not mean to upset the opinions and calculations of other gentlemen who might think differently; but he had tried an anti-dip pipe in all ways—both belonging to others, and to himself—and he found that, by reducing the seal to a very low point, he obtained equal results in a very much more comfortable manner than by using an anti-dip pipe, which really required to be worked with a certain amount of back pressure. Otherwise one had the retorts in a leaky state from over-exhaustion; and if this was done, the retorts went bad in a very short time. He found a light seal of $\frac{1}{2}$ inch better than working with an absolutely open end. Again, Mr. Anderson said that the gas was reduced in illuminating power by being kept in contact with the tar; and at the same time they were told by some that nitrogen could be carburetted by being kept in contact with it. He recommended that to their consideration.

Mr. Harrison Veevers (Dukinfield) inquired why it was recommended to set the retort so as to fall a few inches backwards, so that the tar would escape instead of coming back into the retort. To his mind getting the tar was rather an important economical matter. If 30s. per ton were obtained for the tar, that gave 9s. a ton for the coal. What, he asked, became of the tar if it got into the back part of the retort?

Mr. J. Miles (Bolton) said, if he gathered anything from the paper, it was describing a setting of retorts in which clay and iron were combined for the use of small, medium, and large gas-works. He should have been glad if Mr. Anderson had told them, in his usually clear and concise manner, what were the general advantages to be gained, because he could not understand what they were. In the first place, would he say what his production was in that setting, as compared with an ordinary setting; what he obtained per mouthpiece; and the general cost of the setting—in other words, the general advantages that managers might expect to get from such a setting over one of the ordinary construction?

Mr. T. O. Paterson (Birkenhead) said he observed there was an air passage along each side of the furnace. Was the furnace door sealed up in the usual way employed in a regenerator furnace; and was the air for combustion supplied directly through these passages and no other, or did it pass into the interior of the setting? The make per mouthpiece was certainly low; being only 4773 feet, compared to ordinary working; and there seemed to be a great space taken up in the retort-house. Ordinary or regenerator settings could be had which would give a production of 8000 cubic feet per mouthpiece.

Mr. D. Irving (Bristol) said that the chief feature, and the most original thing in the paper he took to be the twin-retort; and that, he ventured to think, was bad in design in every respect. The results given were not very satisfactory, even although he was prepared to admit that they were reliable, which he was not, seeing that the experiments only extended over three days; and any results whereby they were to gauge the retorts should embrace at the least the whole life of the retort, and not simply three days' working. It would be readily seen that one retort must be heated to some extent at the expense of the other, which was decidedly bad; and the results submitted were no proof of its excellence either in the fuel used or the yield of gas, with the exception perhaps of the gas produced per ton, which was somewhat exceptional, and disagreed with the author's own opinion of what was the proper quantity to get from a ton of coal. With regard to the question of combining clay and iron retorts in three settings, he thought that Mr. Anderson had not made out his case. He had not submitted any figures, or made any comparative statements, as to cost or results, so that they could judge of the relative merits of the combination. He quite agreed with the suggestion about taking off the tar from the under-side of the hydraulic main, notwithstanding what Mr. Valon had said about that—that the thick pitchy tar should be capable of absorbing the richer hydrocarbons from gas, even although nitrogen would not become carburetted by passing over heated tar. The experience of some members would no doubt differ from that; and they would say that the thick pitchy tar would reduce the illuminating power. But Mr. Anderson made out a complete case for clay retorts by saying that gas would not have been sold so cheaply to-day but for the use of clay retorts.

Mr. J. Whyte (Seaham Harbour) said he had had a small experience in the combination of clay and iron retorts; but he found great difficulty in getting the setting to heat properly. He should like Mr. Anderson to say whether he obtained better results in this way than with clay alone.

Mr. H. Tobey (Malton) said that he did not gather whether the percentage of fuel employed was stated clearly in this combined setting; and he thought any advantage it might have would be from a gain in fuel. If Mr. Anderson would give clear figures of the proportion of fuel used for the quantity of coal carbonized, he should be glad to have them.

Mr. A. Edwards (Taunton) observed that there was one point already referred to, on which he would say a word. On the diagrams were represented three settings of retorts, of small size apparently, although the dimensions were not given, but they would extend over a considerable area of ground; and he ventured to say that if any member of the Institute without Mr. Anderson's great status and ability ventured to advise his Board of Directors to take out large retorts and put in small ones of that sort, the matter would be referred to a consulting engineer without very much discussion. They all had to show the best possible results at the least possible expenditure of material and labour; and it seemed to him that in this setting there was a large amount of brickwork which someone had to pay for, and which would add considerably to the cost of construction and renewal. There must also be an additional length of hydraulic main, which also cost something to maintain and watch. On the other hand, so far as the results went, there was absolutely no advantage in production as regarded the gas manufactured or the fuel used. The cost in labour of working a setting of these retorts would be 25 per cent. above that of working a set of five or seven of large area—say 26 inches by 14 or 15 inches. Anyone who had worked both sizes knew that a man would put a considerably larger quantity of coal into large retorts with more ease, and also produce a better result. It was not out of any disrespect to Mr. Anderson that he criticized his suggestions; but he felt that when a setting of the kind shown was exhibited, it was rather too much to expect to have it passed by without anything being said about it.

Mr. W. W. Hutchinson (Barnsley) asked what, in his experience, Mr. Anderson found to be the life of a clay retort and an iron retort. He did not notice that it was given in the paper, although some figures were given, to the want of which previous speakers had referred. Mr. Anderson very properly remarked that iron retorts were really abandoned in the north. He (Mr. Hutchinson) believed almost the first act his father did, when he undertook the charge of the Barnsley Gas-Works in 1852, was to introduce clay retorts instead of iron. He thought that change largely conduced to the prosperity of the gas industry, as it soon produced an alteration in the shape of dividends.

Mr. D. Clarke (Ashton-under-Lyne) said his impression was, so far as calculating the value of the retorts and taking the product per mouthpiece, that this system was entirely wrong. Mr. Anderson gave a production of 4750 cubic feet per mouthpiece; but he also gave a result of above 11,000 cubic feet per ton. He did not make a great quantity per mouthpiece, but a large quantity per ton. In his (Mr. Clarke's) own case, he made 7000 cubic feet per mouthpiece, but did not get 11,500 feet per ton. He thought that the best way of calculating the matter was to take the area of the retort, and the fuel required to heat it, per ton or per bushel. In this case, he thought the fuel account was rather extravagant; being from 28 to 32 per cent. of the fuel produced. That was rather heavy, seeing that he was endeavouring to utilize everything. He agreed with the author so far as light charges were concerned; for he worked entirely with four-hour charges, and experience showed they were better in every sense—not only as regards production, but illuminating power.

Mr. G. Shepard Page (New York) said it might be of interest for the members to know that the last iron retort he saw in action in America was at the works of Mr. Greenough in Boston; and it was taken out finally in 1865. He did not profess to have the practical knowledge of many gas engineers with regard to the use of iron retorts; but he was a little surprised at the recommendation that they should be again introduced. Having recently become interested in a large works at St. Louis, he had hoped to have heard something said of what seemed to him the coming improvement in retorts—viz., the inclined or vertical retorts, one of which had been in operation very successfully at St. Louis. He proposed to make an exploration on the Continent as to the use of that mode of setting; and he hoped it would be to the effect that the stokers' occupation (which was an exceedingly hard one in the North American climate) would be dispensed

with, and that the charging of retorts could be done by gravity. It was also expected that, instead of using the higher-priced lump coal, with the inclined retort, coal dust or slack could be used. This could be handled with great facility—much as they handled grain in grain-elevators—and the coke could be removed and treated mechanically without the application of manual labour, even to the extent of being finally taken away for sale from measuring bins. If any gentlemen present knew where in Great Britain he could see an inclined retort in actual operation, he should esteem it a personal favour if they would communicate with him.

Mr. Anderson, in reply, said it was rather difficult to know where to begin; but he hoped the Council next year would carry out the proposition made that morning—that proofs of papers should be handed to the members before they were read, because a great deal of the criticism made upon his paper had been due to misunderstanding. He would take their American friend first. He wondered why anyone should still use iron retorts, because he saw the last one abandoned about the year 1865. He (Mr. Anderson) was working clay and iron retorts long before 1865, and was working them yet; and he did not work them for other companies' advantage so much as for his own. He was the lessee of a number of gas-works; and it was a question with him of putting money into his own pocket in so far as making cheap gas was concerned. If they had any faith in him, or in his judgment of what was best for himself, they might take that as the sole reason why he used iron retorts. Mr. Valon had rather run against the question of the value of regenerator firing, which was discussed so much two or three years ago, when he talked about contact and radiation; but he (Mr. Anderson) did not intend to go into that very philosophical point, beyond merely stating that they could not heat a clay retort above a certain point, but could heat an iron retort with the heat that was then left, and that was what he did. He heated a steam-boiler on the top of the bed with the waste heat of the retorts; and he found he could get a better heat on the boiler when he was not using iron retorts, but only clay retorts, because they being bad conductors allowed the heat to pass, and it went to the chimney. This fact in itself was a proof there was an advantage to be derived from using an iron retort in combination. The same point was taken up by a gentleman who said the expense of the setting would be 25 per cent. more. It was very easy to make a rash statement about 25 per cent. more or less, but give no proof of any kind. From the way in which he set these retorts he was able to get the work done much cheaper than was usually the case. He had nothing but a few rib-arches for the retorts to rest upon; so that, instead of being dear, they were actually cheap to construct. He had two reasons for adopting the air passage—one was that the bricks in the furnace were always the first to give; and he thought if he could cool them a little without injury, it would be an advantage. He knew also that, when a furnace was filled with a deep fire of coke, it was a physical impossibility to convert the whole of it into carbonic acid, if air was only admitted at the bars. They might convert the fuel into carbonic acid at the bars; but the gases in rising up through the deep mass of red-hot coke were converted again into carbonic oxide by an absorption of an atom of carbon. He could not give any statistics, because he had not any by him; but would simply appeal to their judgment on the reasoning he had brought forward. If carbonic oxide were allowed to flow off from the retorts—and it did flow off from retorts in many gas and other works, for he had seen it in flame at the top of a chimney 100 feet high—50 per cent. of the heat was lost. If there was a very deep fire, and no air was allowed to enter except through the bars, there must be carbonic oxide. Therefore, he admitted some air at a certain place above the furnace which would inflame it, and make carbonic oxide into carbonic acid, and then go along into a farther part of the setting. He was told that his make of gas was small per retort; but that was exactly what it was not. It was possible to make 7000 or even 10,000 cubic feet of gas from a retort; but the question was, How big was it? He stated at the commencement of his paper that he was trying an experiment to prove why they did not make so much gas per ton of coal carbonized as the coal analyses gave—they were always about 1000 feet less; and to show that the fault was with the gas makers, and not with the chemists who made the analyses. He did not intend these retorts for all classes of works. No doubt, as had been said, if any gas manager proposed to pull down a setting, and introduce one of this kind, an engineer would be called in. But he did not ask them to do anything of the sort. A great deal depended on the different sizes of the works; but if what was wanted was to make the most gas from the retorts, small retorts must be used. Big retorts were not advantageous for getting the largest amount of gas out of a certain quantity of coal; nor did they get the best gas. Mr. Clarke said he used three or four hour charges, and found the make of gas was better; and that was exactly what he (Mr. Anderson) had been doing. One gentleman asked why he tilted the retort towards the back-end, seeing that the tar was valuable to sell. According to this argument, they ought to become tar makers not gas makers; and it was to their interest not to make gas, but to make more tar. If he abominated anything in a retort-house, it was to see, when the men took off the lids, a basin of tar lying in the mouthpiece, and every bit of coke that came over it inflamed, and smoked and choked everybody, and the whole atmosphere was dimmed by the volumes of tarry smoke coming off. When he arranged for a small fall in the retort (4 or 5 inches) to the back, these basins of tar did not lodge in the mouth. When the lid was taken off, the mouthpiece was dry. He told his men to be very careful in putting the iron mouthpiece on the clay retort, to arrange that it should be a shade higher than the retort, so that there should be no chance of any tar lying in the mouthpiece. Then, when it was drawn, it was a simple, clean job compared with what it was when there was a lot of tar lying there. It was asked, What were the advantages of iron over clay retorts? All he said was that there was an advantage in using some iron retorts after the clay retorts had been heated, because, if more clay retorts were put in, they would not get heated; but if a few iron retorts were set, they would, and he thus utilized some heat which he should not otherwise do. With regard to giving the quantity of coke by measure instead of weight, he quite admitted the truth of the observation made; but they were not all so highly scientific in this country as they ought to be. They had got into the habit for many years of saying that a ton of coal produced a chaldron of coke; and that was so stereotyped that he had just adopted the phrase. He knew that a ton of coal produced a little more than a chaldron—at least most coal that he used did; but in calculating the fuel, they always reckoned a chaldron of coke to a ton of coal. If there were any more, the fuel always had the benefit of it; and the full account was really less than it was scientifically. The time might come when they would be as well educated as the Germans, who always spoke of the amount of coke by weight, which was no doubt the right way. With regard to dip-pipes, he said he might mention that when he used a dip-pipe for some years, he had the bottom of it serrated (like the teeth of a saw), instead of being a plain pipe cut across; the indentations being about ¼ inch each, so that the gas passed through a number of small V-shaped holes into the water of the hydraulic main. By doing this, there was not that plunging effect which there was when the gas had all to go down through the pipe into the water. It spread itself better over the surface. He believed, to some extent, that this helped the purifying operations, because the gas went through into the water in small particles and mixed with it. He had only given three days' results, because he wanted to cut the observations short. He had sent his son to observe the results accurately for three days; but he could not stop during the whole life of the retort. After three days' experiment, they found that they had too much heat in the centre arch, and must make some alterations; and then he made another three days' experiments with the same retorts, and the results were pretty much the same. He did not say that this mode of setting clay retorts gave any longer life to them; but they would last four or five seasons, and with the brick retorts, although the bottom of the retort formed the top of the furnace, he had had an arch of that kind at work for five years without being demolished—in fact it was taken down because the retort inside was about 2 inches lower than the mouthpiece, by reason of the mechanical wear of drawing the rake over the coke. One gentleman had given a most condemnatory account of the affair; but as he did not support it by any proof, it was not necessary to say anything further than that, if he did not agree with the mode of making a clay retort, and if it were bad in every respect, that was a mere matter of opinion with which he did not agree.

Messrs. H. and C. Davis and Co., of Camberwell, have obtained the contract for the supply of the gas and steam cooking apparatus to Messrs. John Barker and Co., High Street, Kensington. It will be capable of cooking for 500 persons daily.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 91.)

The course of things on the Stock Exchange during the past week was, to a great extent, a counterpart of the predecessor. Owing perhaps to the fine weather and the many distractions from business offered every day, transactions have been decidedly restricted. The markets in general have thus suffered from lack of support; and the tendency is for the most part downwards. But a conspicuous exception to the general rule is offered by the Gas and Water Departments, which, affected by special circumstances, so frequently follow an independent course. Business in Gas has been brisker than it has been for some weeks; and the tone is very good. Among the Metropolitan undertakings, Gaslight has been done almost daily at steadily improving prices; and on the last two days of the week the quotation went up 3½. The secured issues have been quieter, but all the debenture stocks have risen in value. South Metropolitans have been quiet—not much beyond a few transactions in "B" having been marked; but indications point to higher prices. Commercial has not been marked at all. Suburbans and Provincials have hardly been touched, and remain quite unchanged. Among the Foreign division, several of the minor undertakings have shown unusual activity; but the larger issues have been quieter. Of the former, Pará has changed hands repeatedly at good figures; and San Paulo has marked top price. Bahia is improving; and the debentures of Sydney and Buenos Ayres are fractionally better. Chicago second bonds are 2 higher. The Indian pair—Bombay and Oriental—are easier; and the quotation of the latter has receded ¼. Water has been fairly active, and has risen freely in response to the demand for high-class investments, especially water debenture stocks. New River was done at 358 on Thursday; but on the previous day it had reached 365 at the Mart. For the changes of quotation in detail, reference must be had to the price list on page 91.

The daily operations were: Fairly good business in Gas on Monday, at good prices. Sydney and Buenos Ayres debentures were better on *ex div.* adjustment. Nothing was done in Water except East London, which marked top price. On Tuesday, Gas business continued the same; Gaslight "A" being especially firm. In Water, the only feature was a rise of 1 in East London and in Grand Junction. Business in Gas was more restricted on Wednesday; but the tone was undeniable. Gaslight "A" touched top figures. Water was very brisk, with a good demand for the debentures of East London and New River. The former rose 2, and the latter 1. Gas resumed activity on Thursday, and continued to improve. Gaslight "A" was done at 262½; but the quotation was left at 258-62. Bahia and San Paulo also reached top figures. Nothing was touched in Water, except New River, which improved 5. Gas was quieter on Friday, but very firm. The quotation of Gaslight "A" was raised 2; and Chicago second bonds made a similar advance. In Water, a few transactions were marked at good prices. West Middlesex rose 1½; and Chelsea and Grand Junction 1 each. Further advances were made in Gas on Saturday, though business was very limited. Gaslight "A" rose 1½ more; and all Gaslight debentures improved. South Metropolitan "B" was done at top price. The only alteration in Water was a rise of 1 in Lambeth 10 per cents.

ELECTRIC LIGHTING MEMORANDA.

AN AMERICAN LAWSUIT RESPECTING THE EDISON PATENTS—THE SHADY SIDE OF THE PARIS EXHIBITION—EDISON LIGHTING IN MANCHESTER—THE DUKE OF MARLBOROUGH ON OVERHEAD WIRES.

An action, described as "special," in the American newspapers, was recently brought by the Westinghouse Electric Company against the Edison Company, to try the question of priority of invention in regard to the incandescent lamp. The case was heard in Pittsburgh towards the end of May; and at the close the judge took the papers and reserved judgment, which is not likely to be given for some time. It is generally supposed that Edison invented the system of electric lighting by means of fibrous carbon heated to incandescence *in vacuo*, and the system is popularly known by his name; but in 1885 the American Patent Office decided that Sawyer and Mann were entitled to the priority of invention, and the action in question is for an alleged infringement of the Sawyer and Mann patent. This is regarded as one of the greatest commercial causes ever brought before the United States Courts. If the Westinghouse Company win, they will gain control of all the incandescent electric lighting in the States. This Company is one of the most gigantic combinations of capital in the Union, representing investments of $60,000,000 to $75,000,000, and is one of the many concerns founded by Mr. George Westinghouse, junr., and his friends. The curious feature of the present suit is that the fundamental patent in question, of Sawyer and Mann, belongs to the Edison Company for Europe, although it is in the hands of their rivals, the Westinghouse Company, for America. Consequently the Edison Company appear in the case as alleged infringers of a patent which has enabled them to make good their own position in every other part of the world. They cannot therefore destroy the Sawyer-Mann patent in America without imperilling their own property elsewhere. On the other hand, if alleged infringement is proved, the royalties payable by the Edison Company at home will go far to rub the gilding off their previous business. It is a remarkable complication, and there is no wonder that the issue is anxiously awaited by the whole electric lighting interest of the United States.

The chorus of praise and advertisement that has been uplifted in all the Parisian journals respecting the attractions of the great exhibition has evoked from M. Delahaye something that may be characterized as a discordant note. In a recent issue of the *Revue Industrielle*, this writer ventures to say that the illuminations, coruscations of electric lights, &c., of which so much has been made, are not everything that could be desired. The success of the show is, as he remarks, assured; and it is high time that the reverse of the picture should be duly noticed. M. Delahaye evidently thinks that a great national effect of this character should be judged from a different standpoint than that from which one would regard a pantomime or a Buffalo Bill performance. He declares that the spectacle of the illumination of the Eiffel tower, the central dome, and the Trocadéro, and the fireworks of the Grenelle island, curious at the first view, become desperately monotonous, even with the luminous fountains thrown in, when unaccompanied by any relief. At night the lighting of the galleries is a useless luxury, because the machinery is for the most part carefully covered up and the glass cases closed. In the gardens the visitors have nothing better to do than to wander about from right to left and back again until the closing time; and for this luxury the price of admission is doubled and sometimes quintupled. After dark, in short, the place becomes a "gingerbread fair" without intelligent attractions, and destitute of shelter from the weather, with all the outside works of art, &c., at the mercy of an idle, purposeless crowd. It only wants a rainy season to make the exhibition lugubrious, through default of a sensible evening programme. Altogether it would appear that M. Delahaye is disposed to think that a good deal of the money spent in electric lighting at the exhibition is thrown away.

The annual general meeting of the shareholders of the Manchester Edison-Swan Company has just been held, and the report of the Directors, which stated the net profit (including last year's balance) to be £2754, was adopted. Out of this amount a dividend of 5 per cent. was declared, which, we believe, is the first return received by the patient proprietors. A year ago the Directors wanted to launch out into central-station lighting upon a large scale; but the shareholders objected, and accordingly the Company's business has since been carried on in a quiet, unobstrusive fashion. There are signs, however, that the Board are not satisfied with merely acting as agents for the distribution of Edison and Swan lamps in the Manchester district. They have entered into negotiations with the Corporation of Manchester with a view to the promotion of a Provisional Order; but the treaty seems to hang fire. The Chairman of the Company complains that the Corporation stand in their way, and yet do not show any decided indications of wishing to start an electric lighting undertaking of their own. Rumours are afloat crediting the Corporation with some such intention; but nothing comes of it. Meanwhile the local Edison-Swan Company wait and grumble, and profess the greatest eagerness to start a central station if the Corporation will only stand aside. There is reason to doubt the sincerity of these protestations, however, because before anything of the kind can be attempted by the Company more capital must be put into it; and this is precisely what the shareholders have already shown themselves unwilling to do. If the Company really meant to start a lighting business, the Corporation could not prevent them from going to the Board of Trade; but having no money for such a purpose they only talk about it, probably with an eye to advertisement. As the Chairman said at the recent meeting, if the Corporation ever do make a start in electric lighting, they will want lamps, &c., of somebody; and the Company are in reality looking out for the Corporation order for supplies all the time that they proclaim their willingness to undertake the starting of a central station. The Directors probably imagine that if they can frighten the Corporation into starting a station they will reap their reward. It is not a bad notion; but the net is spread rather openly in the sight of the bird.

The great soul of the Duke of Marlborough is vexed at the sight of the multiplicity of telephones and other electrical wires which spread like a cob-web over the tops of the houses in London; and accordingly he has brought the whole question under the notice of the House of Lords, moving for an inquiry into the matter, which should result in the determination of regulations for the future placing of over-head wires in all towns. The Marquis of Salisbury admitted the importance of the subject and had no objection to the proposed inquiry, suggesting, however, that as the session is so far advanced, the Committee should not meet this year. Eventually the motion for the appointment of a Committee was withdrawn, upon the understanding that it will be brought forward again at the beginning of next session, by which time the issue of the Provisional Orders for the London Electric Lighting Companies and the falling in of some telephone patents will have somewhat cleared the ground.

Just at the close of the Royal Agricultural Society's Show at Windsor on the 29th ult., the Pulsometer Engineering Company received a special intimation that the Queen intended to visit their stand (No. 352), on her way to the Grand Stand and the march-past of ponies; and in the evening they had the honour of showing Her Majesty the various appliances exhibited by them—including the Pulsometer, Deane, and other steam-pumps, and their Champion hand ice-making machines, by means of which ice can be produced in three minutes. The exhibits appeared to afford Her Majesty considerable interest.

A DEVELOPMENT IN MOTORS.

THERE is one characteristic of the theoretical and applied science of the present day which has not been brought into prominence in any general review of modern scientific progress that has come under our notice, and yet is well worth recognition. We refer to the industry that is being displayed on all sides in the matter of re-investigating fundamental data. The spirit of inquiry which is so much abroad just now is not satisfied with taking anything for granted on the authority of those compendiums of research and experience commonly known by the name of text-books. Indeed, it is frequently to be observed, when the term text-book is mentioned in connection with a debateable question of data, that there is implied in the reference a reflection upon the value of the record. Students must begin by relying implicity upon accepted text-books for the fundamental data of the science which they intend to master; but as soon as they attain a position of authority, they begin to inquire into the verity of the assumptions with which they worked in their callow days. It is rarely one takes up a standard organ of science without finding a report of some re-investigation of data which learners and outsiders have been accustomed to regard as unalterably fixed. In chemistry, for example, somebody is always making re-determinations of atomic weights which are generally accepted as elementary facts of the science. At the present moment, Lord Rayleigh is understood to be engaged in what may in one aspect appear a work of such supererogation as the synthesis of water, by combining oxygen and hydrogen of greater purity than has ever before been secured. In the department of thermo-chemistry, M. Berthelot has just made a re-determination of the calorific value of carbon, using a method which he regards as superior to all that have ever been tried before. Likewise in physics, there is never lacking someone to declare himself dissatisfied with the grounds upon which so-called first principles have been settled in the past, and to go over well-trodden ground once more for the purpose of making sure. All this, of course, does not interfere with the recognized lines of elementary instruction in the sciences. Students must rest content with the simple generalities in regard to principles, and the round numbers expressive of specific gravities, combining weights, &c., that have served earlier generations. There is no danger of any great alteration in the data deduced from observations of natural phenomena, upon which the higher science has been erected. There was never an age, however, more open to correction of tradition and record than this. If a father in science has given a quantitative expression of a natural fact, it is regarded as the most reasonable thing in the world for his conclusion to be tested over again by anybody who thinks fit to do so in a proper manner. The more advanced a student becomes in any department of modern science, the more he is inclined to distrust tradition and authority in regard to points which are open to independent inquiry. He perceives the reign of law in the universe with an ever-deepening reverence; but he constantly finds additional reasons for questioning attempts to express natural laws in hard-and-fast formulæ.

With regard to the reliability of elementary data in science, the advanced student finds many reasons as he goes on for treating in his own mind as hypotheses and approximations expressions which he once learnt to trust as unquestionable truths. Elementary teachers must have tangible figures and formulæ to work with; but the advanced student has his eyes opened to the methods by which these tangibilities were ascertained, and is often driven to shake his head over results which have been obtained by means that he knows to be defective. He may not always be able to remedy these defects; but so long as he is conscious of their existence, they disturb him. He sees that approximations are often made to pass current for certainties, and knowing as he does the importance of the "infinitely little" in the universe, he sometimes wonders whether the discrepancies of elementary determination may not be quite as important as the stated results. It used to be stated oracularly, as an explanation of phenomena of atmospheric origin which were not understood upon any better principle, that "Nature abhors a vacuum." The fractional numerical expressions that represent many physical and chemical phenomena, according to the latest determinations, might almost lead one to declare in a similar spirit that Nature despises round numbers and exact measurement.

It is to be borne in mind, as a safeguard for the rightful appreciation of the bearings of the modern sceptical tendency of which we have been treating, that we do not refer to the residuum of ignorance which refuses to admit the elementary propositions of modern science, and which maintains that the earth is flat, that perpetual motion is possible in mechanism, and upholds many other delusions of the like nature. Of the men who seriously believe these nonsensical propositions, it may truly be said that one should not argue with them, but only look and pass on. In addition to the paradoxists, whom we have always with us, and whose idle contributions may any day be found in journals read by the amateurs of mechanics, there is another class of contemners of established principles who are worthy of no more regard. These are the people who fill the patent offices of the world with wonderful designs of machines and processes whereby, without an atom of knowledge outside their inner consciousness, they pretend to upset the works of men who have devoted their lives to the study and practice of the industrial arts and sciences. As we have frequent occasion to record, men of this kind can deceive themselves and others, and cause frightful waste of money and time. Gas manufacture is an art that is peculiarly open to adventurers of this stamp, and we are perpetually being called upon to deal with projectors who proclaim their ability to make a ton of coal give 30 cwt. and upwards of products; and the exposure of one impostor does not prevent others from arising in their turn, for these people and their dupes never read reliable journals until compelled to do so by force of circumstances. What we are considering at present is not the paradoxists, or the schemers who outrage principles that they have never learnt to respect; but the authorities who are qualified to criticize accepted data, and the innovators who find unsuspected gaps in authorized methods of applying sound principles. When Berthelot finds the text-books wrong in the matter of thermo-chemical data, or a practical engineer discovers the use of a third cylinder in developing the expansive power of steam as a motor agent, these men take the schools with them, and furnish a pattern for other innovators of the same stamp.

Take the example of Mr. A. F. Yarrow, the well-known builder of launches and torpedo boats, who recently read a paper before the Society of Arts upon the use of spirit as an agent in prime movers. The object is on all fours with the prior communication of Professor Forbes, respecting the use of ammonia for the same purpose—that is to say, the improvement of the utilization of the heat of fuel for motors by the substitution for water of a more volatile medium of conversion. This is a question that has greatly exercised the minds of engineers, who recognize the enormous discrepancy that exists between the power of coal and the duty actually developed by steam-engines. It has appeared probable that if a more volatile fluid than water could be utilized in the same way as water is in the ordinary steam-boiler, the duty of the engine would be increased, because less heat would be required for expanding it to the aëriform state in which it does its work. It is evident that if water only boiled at, say, at 400°, instead of 212° Fahr., it would be a much less efficient agent for converting the heat of fuel into motor energy than it actually is. If, on the contrary, all other things being equal, water evaporated at 150° Fahr., it would be more economical for the same purpose than it is now. The question is, in the first place, what fluid possesses greater volatility than water, and what are its counterbalancing drawbacks. There are so many so-called spirits capable of being classified as volatile in comparison with water; but, to begin with, they are all artificial products, and consequently more expensive than water. The question of the amount of waste in use, therefore, becomes important; and while the whole, or a considerable proportion of the expansive vapour was lost after it had done its immediate work in the motor cylinder, the employment of a costly volatile fluid in the boiler was out of the question, commercially speaking. Modern mechanical practice in this regard is so vastly improved in comparison with old work, however, and so many steam motors do really operate in a closed circuit of vapour from boiler to condenser and back again, that the problem of retaining in a similarway a more volatile vapour than that of water has become a question of degree in planning and workmanship. Accordingly we find Mr. Yarrow turning his attention to a spirit motor as a possible improvement on the steam-engine, having regard to the facts that a satisfactory fluid can be found in petroleum spirit at a reasonable price, and that the confining of the vapour of this spirit is not an insurmountable difficulty to a modern marine-engine builder. It is not our purpose to follow Mr. Yarrow through his paper, but only to record the fact that his first experiments consisted in running an engine of the condensing type with steam and spirit alternately, the heat being supplied by a coal-gas burner, and that the useful effect on the brake was nearly double with the latter agent as compared with the former. The particular kind of spirit employed had a specific gravity of ·680, being intermediate between gasoline, at ·650, and benzolene at ·700. It was ascertained that the same amount of heat would make one-and-four-fifths the bulk of spirit vapour at atmospheric pressure as compared with one of steam. A temperature of 240° Fahr. corresponds with a spirit vapour pressure of 65 lbs., and a steam pressure of 10 lbs. Water at the boiling point or steam can convert spirit into vapour at 45 lbs. pressure. As a matter of fact, Mr. Yarrow is actually building launches in which spirit replaces water, with highly satisfactory results.

It is imposible to help agreeing with the comment of Sir Edward Reed upon Mr. Yarrow's work in this connection—that he would not be surprised if "in further development, it should come to play a very important part in the future." This is precisely the question. A contemporary has been gibing the professors of engineering and physical science for being able to demonstrate on the blackboard that there is nothing wrong in Mr. Yarrow's theory, while they could not predict his success in the same way before he began. There is nothing to be gained by this style of commentary, however, for everybody knows that it is not the part of professors to invent practical machines. The utmost they could do in a case like the one in point would be to say that there was nothing theoretically known to forbid success, if the practical difficulties could be overcome; and Mr. Yarrow perhaps knew this as well as they. The point we would rather dwell upon is the fact that Mr. Yarrow has made one more step forward in the development of motor machinery, and has perhaps shown that coal gas, while a costly fuel for heating a steam-boiler, may be available for a spirit-boiler. The practical application of this consideration may also be left to those whose business it is to deal with such matters. Thus we see, by this one example, that there is nothing final about even such a well-established matter as the conversion of the heat of fuel into motive power through the medium of an expansible fluid.

NOVELTY IN INVENTION.

A good example of the manner in which a newspaper writer, with that free command of words which is so useful to a certain order of journalists, can inflate a report of a small local "invention," is to be found in a recent issue of the *Huddersfield Examiner*. It is a glowing account of an oil-gas process, stated to be the invention of Mr. Thomas Drake, solicitor, of Huddersfield; and the way in which, by way of preface, the value of coal gas, electricity, and water gas is discussed and dismissed, is extremely edifying. Coal gas is magnanimously admitted to have "done good service in lighting dark places;" but although it compares favourably with "even the best of the old-time candles and lamps, it is far from being a perfect or a pure illuminant." The light produced by electricity is recognized as a revival and development of an invention of some utility; but readers are assured that "many improvements in the production and application of electricity for lighting or power are needed before it can be applied and used economically, either on a small or a large scale, with satisfactory results." Then the recent advertisements of water gas are noticed, but not commented upon; and thus the ground is satisfactorily cleared for the introduction of the new oil gas, which is described as a rival source of light, heat, and power, and evidently intended to be understood as something better in all these respects than the gas or electricity previously mentioned. An inexperienced reader would naturally infer from all this introduction that he was about to be informed of something very wonderful. Nothing is spared that would tend to the creation of such an impression. But, whatever may be the effect produced upon a general reader, a gas engineer who should take up the newspaper would smile at discovering, after wading through half a column of painfully-spun verbiage, that Mr. Drake's great discovery is—a simple carburetter!

Lest it should be said that we are disposed to unfairly disparage Mr. Drake's "gas," we will transcribe the Huddersfield reporter's account of it: "A strap is attached to a Root's blower, by means of which air is forced into a chest filled with either oxide of calcium or chloride of calcium. From this chest the air is gathered into a single circular pipe, coiled inside a steam chest or cylinder. Here the air is heated by the admission of steam, and then is conveyed into the bottom of a carburetting machine, after which it is distributed through a circular pipe, by means of numerous small holes, and rises through the material placed in the carburetting-box. The material used on the occasion now under review was benzoline, but any kind of petroleum may be used. The column of oil required is 5 feet, whatever the size of the plant may be, or the quantity of gas to be made. The hot air, in its passage through this column, becomes carburetted; and is gathered in the form of purified oil gas at the top of the box, by a pipe which is immediately connected with a gasholder, where the gas is stored ready for use." If, after reading this lucid description, any reader is yet in doubt as to the character of the process, it is not the fault of the conscientious reporter, who tells all he knows in as many words as he can employ for the purpose.

"Many virtues," we are informed, "are claimed for this gas." This phrase reminds one of an old herbal, and is employed equally irrationally in both cases. The office of the "oxide of calcium chest" is "to exhaust the moisture in the atmosphere, so that the antagonism between water and oil may be removed, and the air thereby rendered a more powerful absorbent of hydrocarbon." It is stated that 1000 cubic feet of "gas" can be made from 1½ gallons of oil at a current market price of 5½d. to 6d. per gallon; the "gas" thus costing from 8¼d. to 9d. per 1000 cubic feet. Without going any farther, it will be as well to qualify this statement as wrong. Having said so much, it is hardly worth while to follow the Huddersfield reporter through his remaining arguments, which constitute an amusing, if somewhat bewildering farrago of scientific terms employed to redeem in appearance what is ridiculous nonsense in substance. One or two specimens of this Huddersfield science lesson may, however, be given: "As the gas is made by utilizing air," we learn, "one-fifth of which is oxygen, and takes up at the point of combustion another portion of oxygen from the atmosphere, it is naturally doubly as rich in that element as coal gas is, and thereby a more perfect combustion and freedom from smoke result in the use of the gas as an illuminator." Again: "This oil gas, while having none of the disadvantages attending the storing of other gases, has all the advantages, and this one is claimed for it in addition—it will preserve and feed (*sic*) iron vessels and pipes, instead of oxidizing and corroding them." We were not aware that iron vessels require "feeding" with oil or anything else; but the information may be commended to the attention of householders, who should evidently never leave kettles and saucepans in the pantry with eatables, and, indeed, had better take to copper and porcelain for all cooking utensils. There is much more of the same quality in this report, which concludes by stating that the gas-making process has been patented everywhere, together with a wonderful boiler, consisting of a coiled pipe, likewise invented by Mr. Drake.

It may be asked why we take the trouble to notice at any length such an empty project as this; but experience tells us that delusion in the matter of gas-making processes is hydra-headed. No sooner is one scheme exposed than another arises to take its place; and so eager is the British public for counters to gamble with, that apparently Lothammer may succeed Lawrence, and Drake follow Lothammer, at the shortest intervals, without sickening speculators. Also, no amount of repetition in this line seems to fill the void of newspaper ignorance. A fresh "gas" process shall be launched in the City every week, and as many luncheons offered to representatives of the Press will procure favourable notices in the newspapers; not one ever hinting at the writer having heard of anything similar in the whole course of his life. There is no present indication that Mr. Drake, of Huddersfield, wants the subscriptions of the public for the support of his gas-making scheme. But it may be presumed that he has not brought his "invention" out and obtained the friendly offices of a local newspaper man without ulterior aims of some sort; and it is therefore our duty to straighten the matter out at once. We have no wish to do any injustice to Mr. Drake, or to anybody else; and hereby engage that if he can maintain the novelty and utility of his process, showing wherein it is preferable to those of Lawrence, Lothammer, *et hoc genus omne*, we will afford him all the publicity for this purpose that the Journal can provide. Without this, we shall continue to hold that the Drake carburetter is a very common sort of thing indeed, and that the less there is said about it in future the better.

If there were the slightest probability of our words reaching those whom they most concern, we would give to all men plagued with a mania for inventing, a little counsel that would be valuable if properly taken to heart by them. There is no patent agency attached to the Journal, as there is to some other ostensibly "scientific" publications that we could name, and we have no sort of interest in recommending people to give themselves up to that passion for inventing which is in many instances as much a curse as the propensity to indulgence in strong drink. Original matter appearing in these columns is often "cribbed"—frequently without a word of acknowledgment—by the editors of journals circulating among engineers, mechanics, chemists, and amateurs of the mechanical arts; and we wish they would take the following and give it currency in the same way. To all men who think they have hit upon some brilliant invention that has been overlooked by everybody else we would say: "Before spending a penny upon patent agents, go to the best available sources of information, and make quite sure that your discovery is as new to specialists in the particular line as it is to yourself." An appalling amount of time, trouble, and money is wasted by all of us, without exception, in verifying old truisms of one kind or another. If it is not the whole truth that "there is nothing new under the sun," there is a preponderance of truth in the saying. Old and half-forgotten discoveries are continually being dragged into light; and it sometimes happens that collateral advances in the arts and sciences render practicable an idea that was once abandoned through being in advance of the times. Far be it also from us to say that there is not plenty of scope for further discovery in the arts and sciences as known to, and practised by, ourselves and our predecessors. All that we insist upon is that the greatest circumspection should be exercised by anyone who imagines that he has got hold of a great invention, especially if it is in connection with any art or industry with which he is not fully acquainted. One of the most original-minded as well as painstaking of workers once said in our hearing: "Whenever I imagine myself to be on the brink of some great discovery in science, I am always extraordinarily suspicous of myself, for I know how easily a man is carried away with the idea of a novelty, and also how chary Nature is of disclosing her laws to an interloper." Of course, it is done sometimes, but rarely. The proportion of the gold produced by Australia and California that came to the lucky finders in the form of nuggets, is infinitesimal as compared with the product of laborious stampings and washings; but it is that which has most fired the cupidity of diggers. So in the arts, it is always the hope of a "big find" that most inspires the hearts of unskilled adventurers. This is the lesson that we constantly inculcate in these pages—the more earnestly because it is too often neglected elsewhere. The daily newspapers are always, like the ancient Athenians, agape for some new thing. It is a thankless, although a necessary office to proclaim that novelty which is worth anything is among the scarcest things in the world. We trust we shall never be backward in recognizing and applauding it when we find it; but to acclaim a novelty where nothing of the kind exists, is simply to bear false witness, and help to perpetuate folly and countenance waste.

The Gas, Water, and General Investment Trust, Limited, announce an interim dividend for the past half year at the rate of 4½ per cent. per annum on the preferred stock, and of 5 per cent. per annum on the deferred stock.

Mr. W. J. Dibdin's Society of Arts Paper on Standards of Light.—Our readers will remember that in December of last year Mr. W. J. Dibdin, F.I.C., F.C.S., read before the Society of Arts a paper on "Standards of Light," the text of which was given in the Journal for the 25th of that month (p. 1108). We are pleased to find that the Council of the Society have awarded Mr. Dibdin a medal for his paper.

Mr. B. H. Thwaite on "Gaseous Fuel."—In a little book of 46 pages, issued by Messrs. Whittaker and Co., of White Hart Street, E.C., Mr. B. H. Thwaite, Assoc. M. Inst. C.E., has published a lecture on "Gaseous Fuel, including Water Gas, its Production and Application," delivered by him in Manchester, under the auspices of the Manchester and Salford Noxious Vapours Abatement Association, in March last. The author deals succinctly with his subject, and in an appendix gives some useful statistics which could scarcely be brought into the lecture. The book will be of interest to those who are taking up the investigation of the subject of which it treats.

Communicated Articles.

ON FLAME.

By W. GADD, C.E., F.R.M.S.

I.

In the year 1885, when I endeavoured to excite a serious study of the nature of heat, flame, combustion, and the conditions and behaviour of the supporter of combustion at different temperatures,* there was a lack of true interest in the subject which is occasionally found to creep over most classes of thinkers, but is nevertheless rather discouraging to enthusiastic students when it is met with. Probably the apathy was in a measure due to the supposition that we knew all that is attainable about the subject, and that our received theories were all fully substantiated and ought to be crystallized into dogmas. The innovator who dares to suggest a doubt of such a comfortable state of affairs, or the inquirer who ventures to ask some awkward question, must expect to meet with scant consideration from the remainder when they have settled down into the satisfied state of mind referred to. Since that time, however, many points have cropped up, various questions have been asked, and numerous facts noted, which are not accounted for at all satisfactorily by the ordinary theories. The present would thus appear to be a favourable time for the presenting of further studies and work on the nature and conditions of combustion.

Mr. F. J. Rowan's paper at Glasgow† is a very welcome contribution; and the only thing in connection therewith to be regretted is that the amount of discussion hitherto bestowed upon it falls very much short of what it deserves. What *is* flame? This is the question asked by Mr. Rowan; and it is one which he evidently thinks has not yet been satisfactorily answered. If he holds that opinion, he is by no means alone. Not that it is desired to infer that the definitions of Dr. Mills, Dr. Percy, and others are erroneous. They are right enough as far as they go, or may readily be accepted; but they do not go far enough to satisfy the mind of an inquirer into natural phenomena. For instance, Dr. Mills tells us that "flame may be regarded as volatile matter undergoing chemical change at a visibly red heat." Certainly, although there is invisible flame, and flame at other than red heat, still, after all, this definition does not present to the mind any conception of a particular physical operation. The same with the definition given by Dr. Percy, which nevertheless very materially advances our knowledge of conditions by limiting the operation to the *surface* of what we understand as a flame.

The complete answer to this question will depend entirely on what theory is accepted of heat itself. Personally, I accept the purely mechanical theory put forward by Professor Tyndall, and adopted by most leading scientific men of the present day. Heat thus becomes a mode of motion; therefore heat *is* motion. It is true that one of your contemporaries, in a series of articles forming part of the 1885 controversy, frankly took a different view. But whatever merits might be ascribed to the anonymous author of those articles, it cannot be said that he succeeded in defining an alternative theory; his position being apparently confined to denying the mechanical theory as laid down by Tyndall, although he was content to adopt the method of calculating heat and temperatures which is founded on that theory. It does not appear that he has any important following among the present teachers of science.

We may take it, then, that heat is a mode of motion; that, as a consequence, the evolution of heat by combustion is another, if not similar mode of motion; and that the phenomenon of flame, visible or invisible, will be motion also—not motion of a mere mathematical point or points, but motion of material substances, be it borne in mind.

In my paper read before The Gas Institute in 1885,‡ I said that "combustion, termed a chemical operation, is really a mechanical phenomenon of a certain order, wherein—in the case (say) of combustion of carbon—we have two molecules of oxygen combining with one of the fuel." As stated, this is termed a chemical operation; and properly so. It is, however, not the less mechanical on that account. There is combination; and two substances, previously separated, cannot combine without an amount of motion proportionate to their distances apart and their mutual degree of attraction. This motion, which we may term "the motion of inrush," cannot be conceived to instantly come to rest, as involving the annihilation of motion or energy, but must continue in some form, probably vibratory and through an elliptical curve. These motions are made manifest to us by the sensation of heat. The total amount of heat in any substance will therefore be measured by the number of molecules in motion multiplied by their speed. The number of molecules we usually measure by the volume and pressure of a gaseous substance, and their speed of vibration by the temperature; and all calculations are, for convenience, made in terms of volume, pressure, and temperature.

To make the bearing of this clear, let us suppose a rod of metal to move to and fro once per second a distance of (say) 1-16 of an inch. *Sight* would easily make us sensible of the motion or force exerted. But let this rate of vibration be increased to a speed of 17 or 18 per second, and our hearing takes up the motion—a deep bass note resulting. As this speed is augmented, the sound rises higher and higher, until, if we have the means of producing about 40,000 vibrations per second, the piercing shrill scream which the previous rates of motion had produced would then suddenly cease, and to us silence ensue. This strange result comes from the fact that the form of the human ear is not constructed to be capable of transmitting a higher speed of movement. Human consciousness of heat commences, according to the best calculations, at about a speed of 5 million vibrations per second, at which rate a faint warmth emanates from the object. It is not, however, until about 400 billions of vibrations per second is reached that the eye of man is capable of taking up the same in the form of light or luminosity; while when a speed of 800 billions is reached, the eye is no longer able to deal with the same, and, so far as humanity is concerned, darkness again ensues. Of course, it is possible, and even probable, that some other animals, or insects, are capable of picking up lower or higher rates of motion in the form of heat and light, just as we already know they are able to pick up higher if not lower speeds than man in the form of sound.

We are now able to examine somewhat the theory which avers that the luminosity of a flame depends entirely on rendering incandescent the particles of free carbon therein. To this end it will be well to try and follow the physical operations of the substances producing the phenomenon of combustion. To keep the problem as simple as possible, we will still suppose the complete burning of carbon in oxygen. Now, prior to combustion, the two elements are separate, which subsequent thereto are in chemical combination. By a wonderful process of selection, each atom of carbon has seized upon two atoms of oxygen, with a force sufficient to set up a molecular speed of vibration of more than 400 billions per second. But let it be clearly seen that this speed or heat is not generated *before* the combination of the particles. On the contrary, it is the direct result. Therefore the heat to produce luminosity is only generated *after* the atom's existence as *free* carbon; and consequently the incandescence is that of carbon dioxide or the products of combustion. It is quite possible and fair to urge that the heat generated by the earlier impacts may be transmitted to the free carbon, and thus render them momentarily luminous. But, apart from the obvious conclusion that such a process would appear to tend to extinguish the flame, there is not time in the operation for such to occur; for the speed of inrush must be so enormously greater than that of mere transmission of motion from particle to particle, that the same will take precedence with its heat and light producing force. This is why a flame is reduced in temperature by the introduction of foreign bodies of lower temperature than itself, as the motion is by such means arrested, and some of the carbon simply prevented from making its desired combination, and is thus naturally deposited on the colder foreign body present. It also accounts for Mr. Siemens's careful and valuable observations as to the necessary freedom for a flame, because anything which interferes with or detracts from the heat-generating force must lower the efficiency of the flame as a heat producer. For a similar reason, moisture and all substances not producing heat by combination act detrimentally to the flame, as a portion of the generated heat is abstracted thereby. If a flame is produced of great intensity, having great surplus energy, then there may be the possibility of some non-combining substances therein being brought to incandescence by transferred heat, and thus adding to the luminosity thereof. Apart from this, whenever and by whatever means the speed of vibration of the atomic particles is kept between the limits previously named, there will without fail be luminosity. It follows that there are invisible flames both below and above the zone of the light-giving speeds, which renders perfectly understandable low-temperature combustion graduated down to mere oxidation, and also extremely high-temperature invisible combustion.

* See JOURNAL, Vols. XLV. and XLVI. † *Ibid.*, Vol. LIII., pp. 761, 854.
‡ See JOURNAL, Vol. XLV., p. 1182; or Gas Institute Transactions for 1885, p. 81.

THE CHEMISTRY OF ILLUMINATING GAS.*

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

XXII.

In directing attention to the various materials that have been adopted from time to time for the manufacture of illuminating gas, the various classes of coal naturally present themselves first. The literature of this subject is so extensive, the published experiments so numerous, and the establishment of coal gas-works so general in almost every part of the world, that it would be simply superfluous here to occupy attention with a summary of the various kinds of coal, their productive capabilities, quality of gas, &c. In the present day, however, when so many new schemes are being brought forward in response to urgent demands on the part of the public for cheap gas, it will be well to glance over the history of past gas projects, which is more extensive than many would imagine. Indeed it would be difficult to bring forward any fresh scheme for gas manufacture that was really distinctively new; but in saying this, it must of course be admitted that future inventors may possibly succeed where their predecessors failed; and that the errors of the past may serve as warning beacons which will materially assist in progress towards the desired haven.

Very shortly after the manufacture of coal gas was established as a commercial undertaking, competing schemes in the shape of "water gas" or "oil gas" were introduced. That the possibility of bringing in water gas as a competitor with coal gas had been contemplated, and attracted a great deal of attention, is shown by the fact that a fairly complete historical notice of the subject

* Continued from previous Volume (p. 1129).

appeared in Vol II. of the JOURNAL.* It comprises an account of the various schemes which had been proposed, up to the date of writing (1850), in the way of decomposing vapour of water by passing it in contact with carbonaceous matter at a red heat, so as to produce hydrogen and carbonic oxide. Repeated attempts have also been made to decompose water directly into its resultant gases without the aid of heat, by the application of electricity; the two gases to be subsequently used for producing light, by means of the "lime-light" system, which is in effect only another form of incandescence burner. One inventor† claimed to be able to produce hydrogen from water by the application of electricity, without at the same time setting oxygen free. The hydrogen was to be carburetted by passing through spirits of turpentine, and thus converted into a luminous gas. It is scarcely necessary to add that none of these schemes proved successful. The poisonous properties of a gas charged with large proportions of carbonic oxide, the expense of reducing the percentage of carbonic acid, which was invariably large, and the fact that where carburation was resorted to it proved more costly than the whole process of coal gas making in the ordinary way, are only a few of the many difficulties that proved fatal to their success. These failures, however, have never acted as a discouragement to subsequent inventors, and down to the present time we have the same old principles brought up, every now and then, in company with alleged improvements in details of apparatus, intended to remedy the defects of the previous schemes.

The possibility of producing water gas at a lower cost than coal gas is very fully considered, in criticizing an estimate published by Mr. Clegg to the effect that water gas could be made in London for 5d. per 1000 cubic feet.‡ It is stated that great difficulty arises in keeping up the heats of the retorts; and the best results that can be secured with that form of apparatus are the decomposition of 26½ lbs. of water and 14½ lbs. of pure carbon per 1000 cubic feet of gas yielded. The composition of the gas is 550 cubic feet of hydrogen, 350 cubic feet of carbonic oxide, and 100 cubic feet of carbonic acid; but if the latter could be decomposed, by passing over incandescent carbon, into carbonic oxide, we should have a mixture consisting of equal volumes of hydrogen and carbonic oxide, produced from 26 lbs. of pure carbon, and 24 lbs. of water. In practice it was found that rather more than 18 lbs. of charcoal, or 20 lbs. of coke, per 1000 cubic feet of gas produced were required. According to some figures published by M. Magnier, Engineer for Gillard's Water Gas Company, the cost for working expenses only would be 1s. 9d. per 1000 feet; the material including 18 lbs. of charcoal, 54½ lbs. of fuel for heating the retorts and evaporating the water, and 49 lbs. of lime for purification. Experiments tried in England agreed fairly well as to the consumption of fuel and charcoal. The wear and tear of the retorts was found an important item—fire-clay retorts having proved utterly unsuitable—and therefore without allowing for the cost of removing the carbonic acid, water gas could not be made in London for less than 11d. per 1000 cubic feet.

The Gillard's Gas Company, it should be stated, aimed at producing a gas richer in hydrogen than ordinary water gas, as they intended it to be used directly by means of incandescent platinum burners, and therefore sought for a gas having high heating powers. According to the report of some French engineers,§ the purified gas produced by this process contained about 75 per cent. of hydrogen, and 17 per cent. of carbonic oxide; but the cost of 1000 cubic feet would be nearly 4s., of which more than one-half was represented by lime for purification.

Mr. Lewis Thompson made some interesting researches‖ as to the cost of converting a non-luminous water gas into illuminating gas. He found that the weight of illuminating matter in common gas was about 10 lbs. per 100 cubic feet, and in cannel gas 15 to 30 lbs. He then assumed that an equal weight of naphtha absorbed into the water gas would give equal illuminating value; but either overlooked or was unaware of the fact that coal gas denuded of its condensable hydrocarbons, retains an appreciable illuminating value, owing to the presence of marsh gas and other hydrocarbons; and therefore, as the results of subsequent researches show, the percentage of condensible hydrocarbons in water gas must be nearly double that in a coal gas of equal photometrical value. Accepting his assumption and also his estimate of the cost of naphtha of suitable quality—viz., 2s. 2d. per gallon, specific gravity 0·850, it would appear that the cost of rendering water gas equal to common coal gas would be 2s. 6d. per 1000 cubic feet; and raising it to the value of cannel gas would cost 4s. to 7s. 6d. per 1000 cubic feet according to quality.

The following practical statement as to the working of White's process is interesting.¶ The visitor found two beds of three diaphragm retorts at work at Southport. Two retorts in each bed were charged with charcoal and used for producing water gas, and the third retort was charged every 4 hours with alternate charges of 56 lbs. and 84 lbs. of Boghead cannel, or 3¾ cwt. per retort per diem. The average production was stated by the men to be 33,000 cubic feet of gas per ton of cannel. Therefore the production from the two beds was only 4130 cubic feet per 24 hours. The quality of the gas was subject to great fluctuations, ranging from 19·15 per cent. to 2·4 per cent. of condensable hydrocarbons. The engineer of the Imperial Gas Company, London, also visited Southport;* and found the purified gas equal in value to about 17 candles, and containing 5 per cent. of carbonic acid. Each cannel retort was charged every 4 hours with 63 lbs. of cannel, and the production was at the rate of 32,000 cubic feet per ton of cannel, or only 5400 cubic feet per day for each settling of two water-gas retorts and one cannel retort. The Imperial Company decided that the process was not worth trying, since the retort producing capacity was less than one-half that obtaining on their own works. According to several statements from inhabitants of Southport and others, it is evident that a yield of 32,000 to 34,000 cubic feet per ton of cannel could not be exceeded at Southport, without injury to the quality of the gas.

At about the same time particulars appeared of an extensive series of experiments with this process by Dr. Frankland, with a set of apparatus similar to that above described.† The result of three days' experiments are given, and the following are some extracts from them:—

	First Day.	Second Day.	Third Day.
Gas per cwt. of resin	1388 ..	1576 ..	1932 cubic feet
Residual oil	4½ ..	3 ..	2 gallons

The composition of the gas was—

	First Day.	Second Day.	Third Day.
Hydrogen	39·38 ..	33·54 ..	47·90
Light carburetted hydrogen	17·58 ..	40·20 ..	21·71
Illuminants	7·75 ..	7·08 ..	7·41
Carbonic oxide	28·98 ..	8·40 ..	18·46
Carbonic acid	6·31 ..	10·78 ..	4·72

The chemical action in the water-gas retorts is stated to be the decomposition of steam by charcoal, with the production either of equal volumes of hydrogen and carbonic oxide, or of two volumes of hydrogen and one of carbonic acid, thus—

$$H_2O + C = H_2 + CO.$$
$$2\,H_2O + C = H_4 + CO_2.$$

This mixture of hydrogen, carbonic oxide, and carbonic acid, together with an excess of undecomposed steam, meets the resin vapour in the resin retort, where it twice traverses the length of the red-hot vessel. The greater portion of the water gas is generated by the decomposition of the excess of steam in the resin retort, as shown by the fact that the weight of charcoal required for the formation of the quantity of water gas obtained was more than twice as much as that which actually disappeared from the water-gas retort. An advantage is said to be thus secured in the fact that the sooty matter which otherwise would accumulate in the retorts and eduction pipes, is converted into a permanent gas. Dr. Frankland also gives reasons based on the above figures for believing that the hydrogen of the water-gas does not take up or combine with carbon, but passes unaltered through the resin retort; and he ascribes the increased proportion of hydrogen obtained on the third day to the decomposition of light carburetted hydrogen by the higher heat employed.

The proportion of water gas mixed with the resin gas was much greater on the second and third days than on the first; and a very instructive point that is brought out is the effect of this process on the production of resin gas. It is stated that, although the water and resin gas do not in any way enter into chemical combination, still the effect of producing them together is the securing of a much better result than would follow if they were produced separately and subsequently mixed. The water gas not only combines with the excess of carbonaceous matter, but rapidly sweeps out of the hot retort the permanent illuminating gases produced by the decomposition of the resin, which would otherwise be decomposed into soot and gases possessing little or no illuminating value. The water gas also saturates itself with volatile hydrocarbons that might otherwise be left behind with the tar in the condensers. Some experiments as to the illuminating value of the hydrocarbon gas seemed to show that it was about equal to the coal gas then supplied in Manchester.

Dr. Frankland extended his researches to the use of coals and cannels in the place of resin as an enriching material,‡ and claimed that a large increase in production of gas, ranging from 46 to 290 per cent., as compared with the usual process of manufacturing coal gas, was secured. A considerable increase of illuminating value, especially in the case of rich materials, was also experienced; and rich cannel gases could be readily and profitably reduced to the ordinary standard.

Dr. Fyfe also tried an elaborate series of experiments on White's processes,§ employing for the purpose Boghead cannel as the enriching materials; and he arrived at the conclusion that, although a large volume of gas was obtained, the actual illuminating value in pounds of sperm per ton of coal was not increased above that obtained by the ordinary process of distillation. He found that the working expenses were greater in the case of White's process. By the ordinary process he obtained 16,093 cubic feet of gas, specific gravity ·650, containing 19·75 per cent. of condensable hydrocarbons, and equal in illuminating value to 3253 lbs. of sperm per ton of coal. White's process gave him 39,553 cubic feet of gas, specific gravity ·575, containing 11·44 per cent. of condensable hydrocarbons, and equal in illuminating value of 3213 lbs. of sperm per ton of coal. Endeavouring to increase the quantity of gas, he found that the result was a much less illuminating value. With a yield of 52,042 cubic feet of gas per ton, the specific gravity was ·462; the condensable hydrocarbon 5·8 per cent.; and the value in pounds of sperm only 1774. Pushing the yield to 75,253 cubic feet per ton, the product had scarcely any illuminating value at all.

* See pp. 244, 264, 282, and 333.
† See JOURNAL, Vol. II., p. 22. ‡ *Ibid.*, Vol. II., p. 350.
§ *Ibid.*, Vol. III., p. 25. ‖ *Ibid.*, Vol. III., p. 23. ¶ *Ibid.*, Vol. II., p. 470

* See JOURNAL, Vol. III., p. 71. † *Ibid.*, Vol. II., p. 123, *et seq.*
‡ *Ibid.*, Vol. II., p. 242, 285. § *Ibid.*, p. 369.

He therefore concluded that "in no instance is there any gain in the amount of light obtained from Boghead cannel by the agency of water, in the method recommended by the advocates of the hydrocarbon process; and that when the quantity of gas is increased to a great extent, there is a decided loss." At a later period, he was able to repeat these experiments, which were made with a small laboratory apparatus, on a practical working scale.* The result was 27,700 cubic feet of gas, specific gravity ·652, containing 13·0 per cent. of condensable hydrocarbons, equivalent in illuminating value to 2830 lbs. of sperm per ton of coal. This shows a loss of 13 per cent. of illuminating value as compared with the results of direct distillation. The conclusion that the cost of the hydrocarbon process was greater than that of direct distillation was also substantiated. "For procuring the same amount of light by carbonizing Boghead coal by the water process, there is an expenditure of about 24 per cent. beyond that at which the light can be got by carbonizing the Boghead coal alone."

It is only fair to add that at a subsequent period† Dr. Frankland carried out some further experiments, using four water gas retorts (instead of two) to one cannel retort, and the results of these fully substantiate his previous conclusions, as they show an increase of 82 per cent. in illuminating value, tested by the photometer, and 290 per cent. in the volume of gas. These two gentlemen appear to agree as to increased quantity, but are at variance as to the quality of the product; and Dr. Frankland alleges certain defects in the apparatus used by Dr. Fyfe which prevented him from securing good results.

The Registration of New Electrical Companies.—One contemporary the *Electrical Review* calls attention in last week's issue to the extraordinary activity now reigning supreme in electric lighting circles. There were registered between the 25th ult. and the 2nd inst. no fewer than 63 new companies, just one-third of which were connected with electricity. Twelve of these, for different districts, were promoted by the House-to-House Electric Supply Company, Limited; and the remainder were miscellaneous. During the electric craze of some years ago, it is remarked that the greatest number of companies registered in any one week fell considerably short of this number; but it is now necessary to register companies within a given period in order to obtain the Board of Trade Licence for this year. Amongst the objects of some of these companies is one "to train and supply consulting electricians, engineers, and skilled workmen."

Projected Exhibition of Domestic Lighting at Falmouth.—We have in previous issues of the Journal alluded to the annual exhibitions of the Royal Cornwall Polytechnic Society; and we note with pleasure that the special feature of the forthcoming one, which, as will be seen from the advertisement in another column, is to be opened in Falmouth on the 10th of September next, is to be domestic lighting by candles, electricity, gas, and oil. Judging by the great success which has attended the previous exhibitions, there is little doubt that the display of each of the above-named illuminating agents will be comprehensive; and encouragement is to be given to intending exhibitors by the offer of medals in the various sections. In addition to the collection of lighting materials and appliances, the exhibition will embrace mechanics, in its bearing upon mining, sanitary, domestic, and general industry; also fine arts, photography, natural history, and all those departments of science, industry, and education which have been identified with the long and useful career of the Polytechnic Society. The arrangements for the exhibition are in the hands of the Secretary of the Society, Mr. E. Kitto.

The Gas-Fittings Supply Scheme for Birkenhead.—In our issue last week we dealt with the proposition submitted to the Gas Committee by Mr. T. O. Paterson, Assoc. M. Inst. C.E., the Gas Engineer of the Birkenhead Corporation, in conjunction with Mr. Birnie, of the Finance Department, in regard to the supply of gas-fittings on the hire-purchase system. The suggestion was not a crude or hastily-conceived one, as some of the members of the Town Council seemed to think. It was really the outcome of experience gained during the past five years of the advantage of the hire system in regard to cooking-stoves; and it was only the natural extension of that system, under which the purchase of 115 stoves has been completed, and 209 are in process of purchase. Of the latter number, 191 are hired to ratepayers within the borough of Birkenhead. Of these, by far the larger number are located in houses assessed at amounts ranging from £13 to £17 per annum; but there are nine in £32 houses, a similar number in £36 houses, and seven in £54 houses. This is abundant evidence that occupiers of good property readily avail themselves of the facilities offered to extend over a term of five years payment for an article costing only about £6. It was therefore inferred that as the hire-purchase system had proved to be an inducement to persons in good circumstances, so also would the extension of the system to the articles enumerated by Mr. Paterson and his colleague attract purchasers from among the occupiers of good cottage houses, and lead to a further increase in the consumption of gas without adding to the fixed charges. There is not much doubt, we think, but that this result would have followed.

* See Journal, Vol. III., p. 359. † *Ibid.*, Vol. III., p. 423.

Technical Record.

WESTERN (U.S.A.) GAS ASSOCIATION.

We give to-day the conclusion of the abstract report of the proceedings at the annual meeting of this Association, commenced in the Journal for the 18th ult., and continued last week.

Mr. G. D. Thompson, of St. Louis, read a paper on "Retort-House Work." He remarked that the force of Clegg's maxim that it was "in the retort-house the money was made," would be appreciated when it was remembered that a considerable economy in purification would represent but an inconsiderable saving per 1000 cubic feet of gas made; but careful attention in the retort-house might increase the yield by about 500 cubic feet per ton, representing a gain of ¼d. to 2¼d. per 1000 cubic feet. In the course of several hints as to coal, he claimed that the net results were improved by mixing good gas coal with a proportion—say, one-fourth—of cheaper coal. At large works it would pay well to introduce stoking machinery; but where the charging was done by hand, he preferred the scoop to the shovel. If the ascension-pipes were cleared thoroughly from below before each charge, he thought there would be but little trouble from stopped pipes. The importance of charging retorts at intervals, so that only one or two in a bench are done at one time, and not the whole set opened at once, as well as of firing or clinkering the furnace before rather than after charging, was insisted upon. Referring to the use of oil as an enriching material, a process described in the *American Gaslight Journal* for Dec. 16, 1886, and Jan. 17, 1887, was highly recommended from personal experience.

Mr. G. A. Hyde, of East Saginaw, Mich., followed with a paper entitled "Meter Accounting: Do I Lose any Meters?" It consisted of a description of a system for keeping a correct stock or record of the meters in use. He said he had sought to fix upon a plan that gave a proof, first, on the first day of each month that no meter had been lost during the preceding month; secondly, that acted as a check on errors in reading the number and index of each meter when set or removed; thirdly, that indicated the number of meters in use at any time; and fourthly, that showed on the first of each month the number of each size of meter in use or in stock. To effect this, he used an order-book with counterfoil, a meter change-book, a meter stock-book, and an inventory book. When a meter was to be fixed, the particulars were entered upon a slip from the order-book, which was handed to a fitter. Having executed the order, the fitter filled in particulars as to the size, number, and index of the meter, and returned the slip to the office. In the meter change-book, all meters sent out are entered, with full particulars, on the left-hand page; and those brought in, on the right-hand page. By this means a balance account can be struck that should agree with the monthly inventory of meters in stock. The balance can be carried forward to the next month, as showing the number of meters in use. Meters sold to consumers are marked off as such. In the stock-book, particulars of the various sizes, &c., of meters in stock are entered; and the inventory-book shows all the meters, whether in use, in stock, or sold, arranged in separate columns for each size. These books can be checked one against the other. A meter shown to be removed in the change-book will re-appear as either being in stock, refixed, or destroyed. A meter purchased from the maker will appear as sent out, or in stock, &c.

A paper on "The Use of Crude Oil for Enriching Coal Gas, and for Firing Bench Furnaces," by Mr. J. H. Woodmansee, of Danville, Ill., was read by Mr. Schofield. The author of the paper claimed to be able to make 22-candle gas with the aid of the crude oil, at a cheaper rate than 18-candle gas could be produced when cannel was used. He introduced the oil through a pipe in the top of an ordinary mouthpiece, allowing it to fall into the upper end of an old piece of 3-inch cast-iron pipe, about 6 feet long, the other end of which rested on the bottom of the retort. A small test-cock was fixed in the ascension-pipe, in order to see that the gas produced was of the right colour. He commenced using the oil about nine o'clock each morning, and continued until the right quality of gas was obtained. At other times the 3-inch pipe was taken out, and the retort used for coal in the ordinary way. He was also applying the oil to ordinary retort-furnaces, by the medium of a steam injector. A bed of six retorts required 50 bushels of coke per 24 hours, during which time it carbonized in each retort four charges of 300 lbs. each, or 7200 lbs. in all. Using 126 gallons of oil and 15 bushels of coke per 24 hours, he carbonized similar charges in four hours, or 10,800 lbs. of coal per diem. He thus saved 4s. 2d. per day per bench, besides securing other advantages.

Mr. L. P. Gerould, of Mendosa, Illinois, was the author of the next paper, which was entitled "Points in the Management of a Small Gas-Works, as Deduced from 25 Years' Experience." It was read by Mr. E. H. Jenkins. He commenced by saying that it was good policy on the part of directors of gas companies not only to take in the gas journals, but to send their managers to attend association meetings; and he passed on to notice the importance of keeping a careful and systematic record of the retort-house operations. Attention was next directed to a set of books suitable for small gas-works, specimens of which were exhibited. The author thought that many gas directors made the mistake of trying to earn large dividends on excessive capital, and that about £1000 capital for each million cubic feet of gas sold per annum was ample for modern small works. Speaking of the electric light, he advised gas companies to leave it alone, and to devote their

energies to the improvement of their works, and the consequent cheapening of gas.

The question-box was next opened, and several important questions were discussed. Replying to an inquiry as to the advisability of using crude oil as an enricher, Mr. Egner said he had tried the oil and found it answer very well; but it did not obviate troubles from naphthalene to which he was subject. On taking to naphtha, however, he not only kept up the quality of the gas, but removed all the naphthalene. Speaking on the subject, "Is a steam-jet exhauster superior to a rotary?" Mr. J. B. Howard said the former might be put in very small works; but on a larger scale he had proved in his own experience that the jet exhauster produced naphthalene, and the rotary one did not. There were, however, some coals that did not produce naphthalene, such as those from Illinois. Attention being directed to the subject of mixing carburetted water gas with coal gas as an enricher, Mr. Boardman said that he was decidedly in favour of the plan. Mr. Lansden supplied a mixture of one-fourth to one-third water gas and coal gas, with satisfactory results. It averaged 20 to 22 candles in quality. He was thus enabled to burn surplus coke to account. Mr. Page pointed out that although oil and naphtha were nearly as cheap in England as in the States, they were never used by the gas companies. The gas consumers objected to mixed gases, and he believed that coal and water gas never mixed thoroughly. If gas was to be made as cheaply as it was in England, it would be necessary to leave oil, &c., on one side, and keep to cannel. Mr. Lansden thought that in England there was not a demand for 20 to 22 candle gas, as was general in America.

THE UTILIZATION OF RESIDUAL PRODUCTS.

By Chas. H. Nettleton, of Birmingham (Conn.).

[A Paper read before the Society of Gas Lighting, New York.]

In a paper read before the 1887 meeting of the American Gaslight Association, on the "Utilization of Residual Products," * the writer stated: "I started in the preparation of this paper with the hope of proving that in most works well managed the residuals could be made to pay 90 per cent. of the cost of the coal carbonized; but here on the seaboard, and through New England, with good caking coal, costing from $4 to $5 per ton, I have very reluctantly come to the conclusion that most of us must content ourselves with 70 to 80 per cent." As my statements were considered somewhat visionary at the time the paper was read (if I correctly interpreted the comments which were made), and as I desire to change my statement somewhat, and, more than all, as large stocks of coke are this year the rule rather than the exception, I have ventured to prepare a short paper on the same subject, particularly with reference to the sale of coke, giving, in an informal way, my experience with residuals since that date; and I hope that, though the story be twice told, it may be of some interest, and possibly profit, to the members of this Society.

First, as to the change of views. I desire to say that the probability of obtaining from 70 to 80 per cent. of the cost of coal from residuals in most well-managed coal-gas works, which I expressed in the paper referred to, I wish to modify so far as this—that I think this is possible only in small works. I have never had experience in the management of large gas-works, and therefore am not in a position to judge accurately of the results that should be obtained but the fact that a number of large works, though ably managed, are unable to reach these figures, is good evidence that I was wrong in the position I took. With small works, however, I am familiar; and I am confident that on the Atlantic seaboard, with an annual production of not more than 50 millions, and under fair average conditions, it is not unreasonable to expect the manager to return to the company 70 per cent. of the cost of the coal, including enriching material, from the sales of his coke, tar, and ammonia water.

In the paper referred to I stated that the receipts from the sale of residual products by the Company with which I am connected, had been as follows:—Year ending April 1, 1883, 47·8 per cent. of the coal carbonized; do., ending April 1, 1884, 46 per cent.; do., ending April 1, 1885, 57·5 per cent.; do., ending April 1, 1886, 54 per cent.; do., ending April 1, 1887, 57·6 per cent. I can now add: Year ending April 1, 1888, 62·2 per cent.; do. ending April 1, 1889, 71·5 per cent.

In making up these figures, the entire cost of delivering the coke has been deducted. In the first five years the labour of breaking coke was deducted only in part; but in the last two years, it has been deducted entirely. In the first six years no labour was deducted for pumping tar; but in the last year, 8c. per barrel was allowed for pumping each barrel. All expenses on the ammonia plant have been deducted, except depreciation.

The following figures give the details of the consumption and cost of coal and the receipts from residuals for the past two years:—

Cost of Coal and Receipts from Residuals, 1887-8.

Coal used—Caking		2893 tons.
Cannel		138 „
		3031 tons.
Cost of above—		
Cash paid for coal		$14,081 27
Inventory of coal, April 1, 1888	$2582 79	
„ „ „ 1887	2302 56	
		280 23
Net cost of coal		$13,801 04
Cash receipts for coke		$7160 60
„ „ tar		1856 53
„ „ ammonia water		631 77
		$9648 90
Inventory of coke, April 1, 1888	$36 00	
„ „ „ 1887	135 00	
		$99 00
Net receipts for residuals made in the year		$9549 90

Per cent. of cost of coal, 69·2.

No inventory is made of tar; but the quantity on hand on April 1, 1888, was larger than in 1887.

Cost of Coal and Receipts from Residuals, 1888-9.

Coal used—Caking		3055 tons.
Cannel		144 „
		3199 tons.
Cost of above—		
Cash paid for coal		$14,620 27
Inventory, April 1, 1889	$2503 23	
„ „ 1888	2582 79	
		79 56
Net cost of coal		$14,699 83
Cash receipts for coke		$7,590 41
„ „ „ tar		2,741 22
„ „ „ ammonia water		205 67
		$10,537 30
Inventory of coke, April 1, 1888	$36 00	
„ „ „ 1889	9 00	
		27 00
Net receipts for residuals made in the year		$10,510 30

Per cent. of cost of coal, 71·5.

More tar was sold than was made; but all the ammonia made was not concentrated.

	1887-8.	1888-9.
Coke sold (including shrinkage on coke broken)	73,908 bush.	85,977 bush.
Coke sold per ton	24·4 „	26·84 „
Coke broken (including shrinkage)	21,898 „	33,601 „

I desire to call your attention to the quantity of broken coke in proportion to the whole quantity sold; being, for the first year, 29 per cent., and for the second, 39 per cent. This sale of broken coke I regard as one of the most important items connected with the sale of residuals at the works in my charge. But for that sale, I am confident that I should have had, at various times in the past two years, large stocks of coke on hand, and in consequence would have been selling at very much lower prices than at present; and by reason of the shrinkage which always comes when coke is stored, the quantity sold per ton would have been less than now. On the other hand, by reason of this sale of broken coke, in addition to the regular demand for the large size, we have been able to sell the coke as fast as made. For more than two years the yard has been kept practically free; and, in consequence, prices have been maintained, a very fair quantity of coke per ton has been sold, and the results as stated above have been reached.

The manager of a New England works, whose ability I highly respect, made this comment in talking on the subject—that he preferred to have a reasonable stock of coke on hand, to provide for a sudden increase in orders. Except in coal famines (which have been rare in the past, and probably will be more rare in the future), there will be no sudden increased demand for coke that cannot easily be supplied from the daily production. Particularly is this true when the trade supplied is the house trade. It varies at different seasons of the year almost directly as the gas production, and continues along from day to day as regularly as the output of gas. From my experience of the past two years, I would not have a stock of coke if it could be avoided.

I have so many times related the story of the method which was finally settled upon to induce people to use coke in their houses, that I know you all must be more or less familiar with it, and so will not repeat it now. But I desire to say that two years ago last February the cards giving the prices of broken coke were sent out for the first time;* and for the year ending April 1, 1888, we received 1750 coke orders at the office—an increase of nearly 1400 orders as compared with the preceding year. For the year ending April 1, 1889, we received 2704 orders. I can also say that the cartage, which is the excess charged above 11c. per bushel on the prices given on the cards, showed at the end of each year a profit, after paying expenses.

The population we supply with gas is located somewhat peculiarly, being confined to a territory about one mile broad by four miles long, the gas-works being at one end, and the larger part of the population at the opposite end of this district. In consequence, we are able to reach less than half the population at the prices quoted. If the works were centrally located so that the entire population could be reached with reasonable charges for cartage, I think there is no doubt that the sales of broken coke would be doubled.

It may be of some interest to you to hear the following figures,

* See Journal, Vol. L., p. 837.

* The cards alluded to by the author had printed on one side of them the prices at which quantities of coke, ranging from 2 to 25 bushels, would be delivered and binned on any floor of a building within one mile of the gas-works. The figures were given in the author's paper read before the American Gaslight Association, to which reference has been already made.—Ed. J.G.L.

which show the shrinkage and cost of labour, and the value of the product when broken by hand and machine; the broken coke being of nearly the same size in each case:—

Broken by Hand-Hammers.

200 bushels of large at 9c. per bushel		$18 00
Produced 168·33 bushels of small, at 11c. per bushel	$18 52	
Produced 10·42 bushels of breeze, at 5c. . .	52	
	$19 04	
Labour eight hours, at 17½c. per hour . .	1 40	
		17 64
Loss		36

Broken by Machine.

200 bushels of large at 9c. per bushel		$18 00
Produced 164 bushels of broken coke, at 11c. per bushel	$18 04	
Produced 9 bushels of breeze, at 5c. per bushel	45	
	$18 49	
Labour, three hours, at 17½c. per hour . .	53	
		17 96
Loss		04

I trust you will pardon the personal element in this paper. I have presented it to you partly to justify the position I took in the previous paper to which I have referred, and partly to call your attention to a method of disposing of coke which has worked successfully in one place. Reasoning from the few to the many is often fallacious; but in this case, I think I am safe in saying that my experience can be duplicated by anyone willing to make the effort.

Marriage of Mr. Ellis Lever.—Last Saturday morning, the marriage took place, at Llandrillo Church, Denbighshire, of Mr. Ellis Lever, of Tanybryn, Colwyn Bay, and Culcheth Hall, Bowdon, Cheshire, with Miss Ada Mary Wormald de Burgh Lawson, daughter of Sir Henry de Burgh Lawson, Bart. of Gatherby Castle, Richmond, Yorks. After the ceremony, the bride and bridegroom left for a tour in Ireland.

Electric Lighting Undertakings for Lancashire.—A Manchester correspondent writes:—"Electric light companies are very busy in Lancashire just now. During the past week or two almost every corporation and local board in that populous county has received notice from one or more of these bodies of an intention to apply for powers to supply electric light. In most intances simultaneous notice seem to have been served by three, if not four, companies. If this unwonted activity should be followed up by actual applications for powers, and by attempts to give effect to them, the manufacture of electrical apparatus will receive a remarkable impulse. So far none of the threatened local authorities have indicated the course they intend to pursue in regard to the proposed applications; but it is not improbable that some of those who own gas undertakings will seek to forestall the companies by obtaining permission to light their own districts by electricity. Much will depend on whether or not the authors of the present notices really mean business. Amongst the companies reponsible for the notices are the Lancashire and Cheshire House-to-House Electricity Company, Limited, the Municipal Electric Light and Power Company, Limited, and the Electric Construction and Maintenance Company, Limited."

The Society of Arts Motor Trials.—In the report of the Council of the Society of Arts which was presented at the annual general meeting on the 26th ult., reference was made to the trials of motors for electric lighting carried out in September last under the auspices of the Society, the results of which were recorded in the Journal for March 12 of the present year (p. 489). These trials are regarded by the Council as one of the most important pieces of work completed by the Society during the past session. The circumstances under which they were conducted have already been set forth; and although the competitors for the prizes offered by the Society were fewer in number than the Council had been led to anticipate would be the case, it was believed that the scientific results which might be gained would justify the Society in undertaking the expense and labour of the tests, and in asking the eminent men who consented to serve as Judges to devote a very considerable portion of their time, at a necessarily inadequate remuneration, to the work of the trials. This anticipation has been fully realized. Never before, the Council believe, have any similar comparative tests of gas-engines been made, or with such elaborate measurements. It may be remembered that four gold medals were awarded—one to Messrs. Davey, Paxman, and Co., for their 8-horse power compound portable steam-engine; one to the British Gas-Engine and Engineering Company, for their 6-horse power Atkinson's "Cycle" gas-engine; one to Messrs. Crossley Bros., for their 9-horse power "Otto" gas-engine; and one to Messrs. Dick, Kerr, and Co., for their 8-horse power "Griffin" gas-engine. The Council hope that similar trials may be conducted, either by the Society or by some other independent and trustworthy body, after the lapse of sufficient time; and they are convinced that the trials conducted under the auspices of the Society will suffice to form a standard for comparison with whatever may be obtained in future years. Professor Kennedy, F.R.S., one of the Judges, read before the Society during the session an interesting paper on the objects and method of the motor trials, for which he has been awarded a medal.

Register of Patents.

Gas-Engines.—Barker, T. B., of Birmingham. No. 11,242; Aug. 3, 1888. [8d.]

This invention relates to the valve arrangement of gas-engines. In gas-engines as hitherto constructed, the governing of the engine is sometimes accomplished by diluting the entering charge by throttling the gas supply; but this dilution, says the patentee, can only act economically and efficiently within certain limits—beyond those limits dilution causes the mixture to become uninflammable, and so occasions loss of gas by missing ignitions. Part of the present invention meets this difficulty by arranging to cut off the gas supply altogether before the point of dilution is reached, where there is danger of missing fire; and it consists of a method of securing first a graduated but positive throttling action of the gas-supply valve, and then a complete cut of. Another part of the invention relates to methods of overcoming the difficulties sometimes experienced in using igniting-valves, due to their alteration of temperature under varying loads. The studs holding down these valves require to be screwed up to a certain pressure, in order that the explosion may not lift the valves from their faces; and it often happens that, on expanding by heat, the valves bind and cut, from undue pressure of the studs. The construction of the holding-down studs in this patent is such that, although screwed down, they have a certain elasticity and yield slightly; or it is arranged that they become heated by the increasing explosions, and thus, by their expansion, relieve the excessive pressure caused by the expanding-valve.

One arrangement of governing gear is as follows:—A lever receives a to-and-fro motion from a cam, on the second motion shaft; and it has one face serrated—the teeth extending for some distance from the end towards the fulcrum. A second lever carries a sliding-block with a simple knife-edge projection; and this lever moves in the same plane as the other; and the sliding-block is moved on it by a link from the governor. The gas supply-valve spindle is actuated from this lever; and as the governor moves the block along it, so does the block knife-edge engage any particular tooth of the serrated lever, and increase or diminish the lift of the gas supply-valve. The positions of the lever fulcrums are such that, for each position of the knife-edge, there is a particular lift of the gas-valve; and therefore a positive dilution. But the point of opening and closing the valve remains throughout the whole range of serrations. When the speed exceeds a certain limit, the block is moved beyond the end of the serrated lever; and the gas-valve remains closed until it falls again. The gas-valve may be closed by a spring or weight; and the levers may in like manner be returned to their stationary positions, by spring or weights.

Gas Fires or Stoves.—Main, R. B. and A. P., of Glasgow. No. 11,431; Aug. 8, 1888. [8d.]

This invention relates to gas fires or stoves of the kind wherein pieces of metallic fretwork, or like perforated or porous refractory material, placed in front of a fire-clay slab are heated to incandescence by the flame issuing from a Bunsen or other burner thereunder, and are applied in grates or fire-places for the purpose of heating apartments mainly by radiation; and the improvements have for their object such modification of construction as to ensure greater efficiency, and a closer resemblance to an ordinary coal fire, than has hitherto been obtained by the combustion of gaseous fuel in such stoves.

Converting Solid Fuel into Gaseous Fuel.—Taylor, W. J., of Chester, U.S.A. No. 4807; March 19, 1889. [8d.]

This invention relates to improvements in the method of, and apparatus for, converting solid fuel into gaseous fuel for heating and other purposes, in regard to which the patentee remarks that heretofore it has been practically impossible to run gas producers uninterruptedly, or to any reasonable capacity, owing principally to the difficulties experienced in removing the accumulating non-combustible material therefrom, and especially when anthracite coal or culm was used as the fuel for generating the gas. Further, it has been found difficult to maintain, without excessive clinkering, a solid fuel bed—that is, one not porous or honeycombed, which gave an excess of carbonic acid in the gas; and it has also been found difficult to avoid waste of the carbon through grates or other similar appliances and excessive labour in the production of the gas.

The principal objects of the present invention are, first, to utilize anthracite coal, culm, or other fuel for the manufacture of gas, and to fire the same upon a supported bed of non-combustible material extending into the furnace chamber to, at, or above the air or steam and air discharge; second, to ascertain with certainty the dividing line between the non-combustible material and fuel being converted into gas; and, third, to discharge accumulating non-combustible material at intervals either uniformly or more rapidly in one place than another from the chamber, while the furnace is in full operation. The invention consists broadly in placing and maintaining a deep bed of non-combustible material or ash under a bed of more or less incandescent fuel in a furnace, and drawing or blasting air or steam or both into the fuel for its conversion into gas.

Gas-Burners.—Wyngaert, F. van den, of Berlin. No. 6613; April 17, 1889. [6d.]

These improvements apply to ring or cluster-jet burners, and are devised specially with a view to ensure—owing, under the arrangement adopted, to the depending jets of each of the gas-supply rings of the burner being "stepped" in length relatively to those of the other rings—not only perfect combustion of the gas, but at the same time to prevent the contingency of the flames of the jets of one burner impinging upon and interfering with the illuminating efficiency of those of the other rings.

Gas-Fires.—Fletcher, T., and Clare, A., of Warrington. No. 6700; April 20, 1889. [6d.]

This invention relates to the type of gas-fires in which solid or perforated lumps of fire-clay are rendered incandescent by flames issuing

from gas-burners. When a mass of such lumps of incandescing material is employed in the ordinary manner, say the patentees, the incandescence of the front portions of the fire only is visible; and there is therefore an apparent want of depth in the fire. Owing also to the solidity of the lumps, a considerable time is required before the masses become visibly heated. Further, since the lumps are generally formed of a mixture of fire-clay, asbestos, and sawdust, they are very friable; and by their disintegration in use they soon fill up or obstruct the openings of the burners. These improvements consist, therefore, in constructing and employing for the incandescing portions of gas-fires hollow spheres or shells, of any suitable form and size, constructed of fire-resisting material, and having their walls perforated—the fire-resisting material preferred being a mixture of fire-clay and asbestos, or cast or wrought iron.

INCREASING THE LIGHT EFFECT OF GAS, PARAFFIN, AND OTHER FLAMES.—Kreissig, C., and Seim, O., of Grüna, Saxony. No. 6920; April 25, 1889. [6d.]

This invention of a method of producing an increased light-effect from gas, paraffin, and other flames consists in "causing the flame to play upon a suitable shaped body of earthenware or the like, such body by its becoming white-hot aiding combustion of the flame matter, and otherwise helping to intensify the brightness of the flame."

CARBURETTING GAS-LAMPS.—Kitson, A., of Philadelphia. No. 6991; April 26, 1889. [8d.]

This invention relates to carburetting gas-lamps adapted particularly for enriching combustible gas with the vapours of a solid crystalline hydrocarbon. The objects of the invention are to provide, first, an improved valve for turning the gas on and off, and for altering and properly proportioning the admixture of plain gas with carburetted gas flowing to the burners; second, improved means for connecting the carburetting vessel to its cover, which carries the burners, and forms a gas-tight joint between the parts; third, an improved cartridge composed of a hydrocarbon reservoir, an absorbent wick, and a vapourizing and carburetting chamber adapted particularly for accelerating the carburetting operation so soon as the gas is lighted at the burners; and fourth, improvements in "the general details of construction and arrangement of the parts of lamp, by which it is made more convenient, durable, and ornamental."

APPLICATIONS FOR LETTERS PATENT.

10,239.—PEASE, E. L., "Improvements in stoves or fire-grates for burning coke, in which a better combustion of the coke is effected by the aid of jets of gas or of gas and air mixed." June 24.

10,256.—BOULT, A. J., "Improvements in manufacturing gas." A communication from W. G. Wood. June 24.

10,286.—ROGERS, N., and WHARRY, J. A., "Improvements in gas-engines." June 24.

10,306.—HAMER, F. G., "Gas appliances." June 25.

10,323.—FOX, S., "Improvements in water-gas generators." A communication from E. Blass. June 25.

10,327.—WARD, J., "Lighting gas by means of a spontaneously inflammable gas." June 25.

10,338.—IMRAY, O., "Gas-lamps." A communication from C. S. Upton. June 25.

10,409.—SCOTT, C. H., "Improvements in brick-kilns fired by gas." June 27.

10,447.—FULLFORD, E., and LAUN, H. T. VAN, "Improvements in regenerative gas-lamps." June 27.

10,488.—DINSMORE, J. H. R., "Improvements in or connected with apparatus used in the manufacture of gas from coal and analogous substances." June 28.

10,492.—LINFORD, C. T., "Improvements in gas-engines." June 28.

10,531.—BIRNBAUM, T., "Improvements in or connected with gas brackets, chandeliers, or pendants." June 29.

10,567.—ROUGET, P., "Improvements in gas-meters." June 29.

10,570.—HASLAM, E., "An improvement in gas cooking-stoves." June 29.

10,581.—JOHNSON, J. C., "A new or improved producer for making ordinary producer gas and water gas and coke." June 29.

GOOD MANAGEMENT AT THE ABERAVON GAS-WORKS.—At the last meeting of the Aberavon Town Council, the Mayor (Mr. J. M. Smith), who is Chairman of the Gas Committee, in moving the adoption of the minutes, said he was pleased to state that the accounts of the gas undertaking for the year ending March 25 last were so satisfactory that the Committee intended making a further reduction of 5d. per 1000 cubic feet in the price of gas from the 25th ult., which would bring the figure down to 3s. 9d., with discounts ranging from 5 to 15 per cent. Although the gas-rentals were about £70 less than in the preceding year, the profits were nearly £300 more. During the seven years Mr. H. Bond has had the management of the works, the price of gas has been reduced 1s. 3d. per 1000 cubic feet, and 10s. per public lamp.

ADOPTION OF THE DINSMORE GAS PROCESS AT SALFORD.—At the monthly meeting of the Salford County Borough Council last Wednesday, Mr. H. Lord, the Chairman of the Gas Committee, proposed the following resolution:—"That the offer of the Dinsmore Gas Company, Limited, of the right to use their patent process for the manufacture of gas at the Salford Gas-Works for a payment of £8250 be accepted, subject to the proviso that the Corporation may extend the period of option of purchase at the price named for a further term not exceeding twelve months beyond the six months originally proposed, on the payment for such twelve months, or any part thereof, of ¼d. per 1000 cubic feet for all gas made in that period under the Dinsmore process, and subject also to terms and conditions to be embodied in a contract to be prepared by the Town Clerk." Mr. Lord stated that the Gas Committee had seen this system in operation at Widnes. The results of their examination were so extraordinary that they asked for figures respecting the working of the process in that town; and they were informed that it actually resulted in an extra profit of £16,000 in the first twelve months of its adoption. The Committee calculated that the profit in Salford would in one year more than cover the price asked for the right to use the patent. Mr. R. Holland seconded the motion, and it was carried.

Parliamentary Intelligence.

HOUSE OF LORDS.

MONDAY, JULY 1.

The Swansea Corporation Bill was referred to a Select Committee, consisting of Lord Brassey (Chairman), Earl Doncaster, Lord Braye, Lord Carysfort, and Lord Savile; to meet on Thursday, July 4.

THURSDAY, JULY 4.

COAL DUTIES (LONDON) ABOLITION BILL.

This Bill was brought from the Commons, and read the first time

FRIDAY, JULY 5.

COAL DUTIES (LONDON) ABOLITION BILL.

Lord BALFOUR moved the second reading of this Bill, and briefly explained its purpose.

Lord LINGEN, as Chairman of the Finance Committee of the London County Council, said the Council regarded the Bill with dissatisfaction; inasmuch as the Committee of the other House to whom it had been referred had not reported any evidence, nor had the City produced any accounts. The most important part of the Bill was the last section (section 2), which appropriated certain surpluses; but, looking to the speech and the figures quoted by the Chairman of the Committee (Sir Lyon Playfair) and certain members of the other House, the object appeared to be the beginning of a settlement of Metropolitan debts, taking the Holborn Valley improvements as the first to be dealt with.

Lord BALFOUR said there was a debt on the Holborn Valley improvement of £744,000. Against this had to be placed £160,000 from savings and other sources; and the estimated 4d. tax might be put at £140,000—making £300,000. This debt was not affected in any way by the Bill; and the City of London would remain responsible for the whole balance thereof.

The Bill was then read a second time; the remaining stages to be taken on the 8th inst.

The following further progress was made with Bills during the past week:—

Bill read the first time: Cheltenham Improvement Bill.

Bills read the third time, and passed: Gas and Water Orders Confirmation Bill, Liverpool Corporation Bill.

Bills Royal Assented: Burnley Corporation Bill, Cleveland Water Bill, Heywood Corporation Bill, Padiham and Hapton Local Board Bill, Windermere District Gas and Water Bill.

HOUSE OF COMMONS.

TUESDAY, JULY 2.

The Barrow-in-Furness Corporation Bill, the Barrow Hæmatite Steel Company (Water) Bill, the Electric Lighting Provisional Orders (Birmingham Order) Bill, the Rastrick Water Bill, the Barry and Cadoxton Gas and Water Bill, the Bury Corporation Bill, and the Metropolitan Electric Supply Bill were referred to a Select Committee, consisting of Lord Francis Hervey (Chairman), Sir F. Mappin, Mr. Royden, Mr. D. A. Thomas, and Mr. Bonham-Carter (Referee); to meet on Tuesday, July 9.

ELECTRIC LIGHTING PROVISIONAL ORDER BILLS.

Bills to confirm certain Provisional Orders made by the Board of Trade under the Electric Lighting Acts, 1882 and 1888, relating to Chelsea; St. George's, Hanover Square; St. Mary Abbotts, Kensington, and St. Margaret, Westminster; St. Martin-in-the-Fields; St. Giles's, Lambeth, and Marylebone, were brought in by Sir Michael Hicks-Beach and Mr. Jackson, read the first time, and referred to the Examiner.

COAL DUTIES (LONDON) ABOLITION BILL.

Sir L. PLAYFAIR (Chairman of the Select Committee on the above-named Bill) called the attention of the House to the fact that the London Coal Dues would, in the ordinary course of things, expire on the 5th inst. It would be remembered that the House had referred the Coal Duties Abolition Bill to a Hybrid Committee, with instructions to inquire whether any equitable conditions could be placed in it to enable the Corporation to meet the debt of £700,000 still owing in respect of the Holborn Valley improvement. The Committee had that day reported; and the further consideration of the Bill was put down for the following day. He wished to ask what course the Government would adopt in these circumstances. One amendment made by the Committee was that they provided for the continuance of a coal duty of 4d. a ton for twelve months longer, in order to give relief to the Corporation in respect of their debts.* If the Bill did not pass and become law before Friday next, the coal dues at 13d. would wholly cease, and there would be no taxation on the coals of London. He therefore asked what course the Government intended to take.

Mr. W. H. SMITH said he recognized the extreme urgency of the case. In the special circumstances, he thought he should be justified in asking the House to suspend the Standing Orders on the following day.

Mr. STUART gave notice that he should oppose the motion.

WEDNESDAY, JULY 3.

COAL DUTIES (LONDON) ABOLITION BILL.

Mr. W. H. SMITH moved—"That the Order of the Day relating to the Coal Duties (London) Abolition Bill, if not previously reached, be taken at half-past five of the clock this day, and be then proceeded with, though opposed, and the proceedings thereon be not interrupted, and that the House do continue to sit until they are disposed of."

Mr. J. STUART opposed the motion, and said he should take a division upon it, as he objected to the whole of the Metropolitan area being taxed for City improvements. He complained that the Government had not brought the matter forward at an earlier period of the session.

Sir R. FOWLER said although the report of the Select Committee on the Bill was not quite what the Committee expected, and was to a certain extent adverse to their views, they intended to loyally support the Bill, and to do all in their power to pass it into law.

Sir LYON PLAYFAIR (Chairman of the Committee) said the merits of the question would have to be discussed later. If the Bill were not to pass, everything would be disorganized; and, knowing this, the trade of the City would be disturbed if the Bill did not become law on Friday. He thought the Government were justified in the action they had taken.

After further discussion, the motion was carried by 135 votes to 199.

At a subsequent stage of the sitting, the House went into Committee on the Bill.

Mr. PICKERSGILL moved, as an amendment, to omit the clause inserted by the Select Committee allowing the Corporation to impose a duty of 4d. per ton on coal for one year from Friday, July 5, 1889, to be applied in discharge of the debt on the Holborn Valley improvements. He said that by the insertion of this clause the character of the Bill had been entirely altered. It was now not a Coal Duties Abolition Bill, but a Coal Duties

* See report of proceedings before the Select Committee, on next page.

Continuance Bill, because it enabled the Corporation to impose a duty of 4d. per ton for a year. He opposed the alteration, in the interests both of the inhabitants of Greater London and of the coal industry of the North of England.

Mr. H. W. Lawson supported the amendment.

Mr. Baumann supported the Bill as amended by the Committee. He said that there was an outstanding debt of £740,000 on the Holborn Valley Improvement; and the Corporation asked that the Metropolis should contribute the sum of £372,000. Out of this sum the Corporation offered to deduct £160,000, being £100,000 left over after the freeing of Kew and other bridges, and £60,000 the surplus in the hands of the Corporation from the drawback on coal brought into London for exportation; and this would reduce to £212,000 the amount they desired the Metropolis to contribute. The Committee recommended that the Metropolis should pay £143,000—a duty of 4d. per ton for one year—and he thought this was a very reasonable compromise.

Mr. J. F. B. Firth said the situation was much more serious than had yet been apprehended by honourable members. If the Bill passed in its present form, it would have far-reaching effects in directions not yet considered. They did not want the Bill. Let it be dropped, and let the liabilities when they arose be met as the Metropolis had hitherto met and always would meet its liabilities. This Bill was introduced solely in the interests of the seaborne coal owners of the North of England. The importation of coal into London from all sources last year was about 12,000,000 tons, of which quantity 7,400,000 tons came by the Midland and Great Northern Railways, who could, if necessary, bring up the whole of the 12,000,000 tons required for London. The City had stated that they could tax some of the railways; but the Midland and Great Northern they could not touch. Therefore the ratepayers could get an absolutely full and free supply of untaxed coal through these lines; and it was proposed by the Bill to tax people who would but for it be able to get untaxed coal on the 6th inst. The step was a very serious one. The only liability for which this enormous compensation was asked was the liability of the seaborne coal owners to have the duties of 4d. and 8d. levied against them. The position they took up was that when these rights were established in a court of competent jurisdiction, it was time enough to consider what Parliament might do for them. If the Bill went on, it had no right to go farther than to give in exchange for what had been taken away that which it was really worth; and he contended that this was very small.

Sir Lyon Playfair said he began his work with a thoroughly open mind; and the Committee treated the question in a perfectly fair manner, with the result that the report was agreed to with one dissentient. He thought that the proposal of the Committee which was not made until after a very careful consideration of the whole case, was a very moderate one, and ought to be accepted as a compromise. He did not know any instance in which the House had taken away rights or duties belonging to a corporation or an individual without giving some compensation.

The amendment was then put, and lost by a majority of 56.

The Bill was then reported to the House without amendment, and the third reading postponed till the next day.

Thursday, July 4.

COAL DUTIES (LONDON) ABOLITION BILL.

On the motion for the third reading of this Bill,

Mr. Pickersgill opposed, and protested against the way in which the measure was being forced through the House.

Mr. Howell moved, as an amendment—"That the Bill be read a third time that day three months." He characterized the keeping back from the House of the report of the Select Committee as very significant, and ascribed the way in which the Bill was being, as he alleged, hustled and hurried through the House to an unholy alliance entered into between the City Corporation and some of the northern coal-owners for their own special benefit.

Mr. Webster, as a Metropolitan member, looked upon the Bill as one which was much against the interests of his constituents. Still, as clauses had been inserted to give fair-play to existing rights in the City of London, he did not object to it in that way. But he opposed the Bill absolutely, completely, and *in toto*, because he believed that in the past the coal dues had not been felt by individuals in London; and he did not think their abolition would enable Londoners to purchase coal one iota cheaper.

On a division, the motion was carried by 226 votes to 106.

The Bill was then read the third time, and passed.

LONDON COAL AND WINE DUTIES CONTINUANCE BILL.

The order for the second reading of this Bill, which was introduced early in the session by Sir R. Fowler and Mr. Baring, was read and discharged, and the Bill withdrawn.

ROSCOMMON WATER SUPPLY.

Mr. Hayden asked the Chief Secretary for Ireland whether, in consequence of a difference of opinion between the Local Government Board and the Local Board of Guardians, the town of Roscommon had been left for several years without a proper supply of water, to the great danger of the public health, as well as to the existence of the town; whether he was aware that seven years ago a fire occurred in the town, which, owing to the want of a water supply, could not be extinguished until damage to the extent of several thousand pounds had been caused—upwards of £5000 of the amount having to be borne by the public rates; whether the ratepayers of the town had on various occasions expressed themselves in favour of obtaining a good water supply; whether complaints had reached him that, pending the dispute between the two bodies named, over which the ratepayers had no adequate control, the town of Roscommon was to be left without a supply of water; and whether he could take any steps in the matter.

Mr. Balfour said the delay had arisen through the Guardians, who were the sanitary authority of the district, desiring to make the whole union of Roscommon contribute to the cost of supplying water to the town, and to levy a rate on persons who would derive no direct benefit from the supply. This proposal was not approved of by the Local Government Board, who had made an order fixing the charge on the electoral division of Roscommon, which embraces the town. The responsibility in the matter rested altogether with the Guardians.

Friday, July 5.

THE LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

The order for the second reading, on the 17th inst., of the Metropolis Water (No. 2) Bill, which was introduced by Mr. O. V. Morgan on the 26th of February last, to "enable the County Council of London to introduce new supplies of water into the Metropolis, and to acquire the rights of existing Water Companies," was read and discharged, and the Bill withdrawn.

Mr. O. V. Morgan subsequently obtained leave to bring in a Bill to enable the County Council of London to purchase the rights of the existing Water Companies; and it was presented, under the title of the Metropolis Water (No. 3) Bill, read the first time, and ordered for second reading on the 17th inst.

The following further progress was made with Bills during the past week:—

Bills read a second time, and committed: Belfast Water Bill, Bury Corporation Bill.

Bills reported: Eastbourne Water Bill, Gas Provisional Orders Bill, Water Provisional Orders Bill.

Bills read the third time, and passed: Plymouth Dock (Devonport) Water Bill, Wakefield Corporation Bill.

Bill withdrawn: Barrow Hæmatite Steel Company (Water) Bill.

HOUSE OF COMMONS COMMITTEE.

(*Before Sir* Lyon Playfair, *Chairman*; *Mr.* Baumann, *Mr.* H. W. Lawson, *Sir* Richard Temple, *Sir* Bernhard Samuelson, *Sir* Stafford Northcote, *and Mr.* Hargreaves Brown.)

THE COAL DUTIES (LONDON) ABOLITION BILL.

The Select Committee of the House of Commons appointed to consider the above-named Bill held their first meeting on Thursday, the 27th ult., and continued their investigation till the 2nd inst. The following is an abstract of the evidence of the principal witnesses:—

Mr. *B. Scott* (City Chamberlain) explained that the prescriptive right of the Corporation as to coal dues became chartered in the reign of James I. It amounted to 4d. per chaldron for measuring; 8d. being the due where coals were weighed. The second Charter of James confirmed the 8d. The Act 2 and 3 William and Mary, cap. I., was the first statute confirming the Charters of the Corporation and reciting them. The present due leviable by the Corporation was 1s. 1d. per ton. Payments from the coal dues had been assigned to the Metropolitan Board of Works for public improvement purposes. The loans for the Cannon Street and Holborn Valley improvements, levied not on the security of the coal dues alone, amounted to £1,715,000. The 4d. duty on sea-borne coal in 1887 would be £78,385; and on railway-borne coal, £97,798. In respect of the improvements £744,768 were due, with no estates to meet them, except the coal dues (if they were continued) and the property of the Corporation. Altogether, the money borrowed under successive Acts of Parliament came to £1,715,000. By the sale of land, ground rents, reversions, profits on investments, and other matters, the Corporation received an additional amount of £1,066,400. This had been spent on the repayment of loans on the Holborn Valley improvement, the existing charges when the improvement was entered upon, and interest.

Mr. *R. W. Cooper*, solicitor, of Newcastle-upon-Tyne, said he appeared on behalf of the coal-owners of Northumberland and Durham. He agreed with the historical exposition by the City Chamberlain as to how the City had obtained its prescriptive and chartered rights. He had consulted Sir Horace Davey, who had given his opinion that in the event of no legislation being passed continuing the existing coal dues beyond the 5th of July, the Corporation would be entitled to resume all rights of weighing and measuring coals, and to demand the metage and other dues which they were entitled to in 1831; that the 4d. per chaldron metage granted to them would be leviable in perpetuity without reference to services rendered, on the allegation that the Corporation was ready and willing to measure; that the Corporation could resume the exercise of the right of weighing conferred by the Charter of 12 Jas. I., and charge the fee of 8d. per ton, but that they could not charge both the 4d. and the 8d.; and that in order to carry out the intention that after the 5th of July no duty or tax shall be levied by the Corporation on coals brought into the Port of London, legislation was necessary. There was practically no difference between himself and the City Chamberlain as regarded the legal rights of the Corporation. In his opinion, if the Bill passed through Committee unchanged it would entirely destroy the prescriptive and chartered rights of the City in respect of the dues.

Mr. *H. H. Crawford* (City Solicitor) gave evidence as to the legal position of the railway companies in regard to the dues. In the Railway Companies' Acts, with the exception of the Great Northern and Midland Railways, clauses were inserted protecting the ancient rights of the Corporation of the City of London. Undoubtedly the Bill as drawn would sweep away everything. The rights were revived and sustained by the second section of the Act 8 and 9 Vict., cap. 101. It might unquestionably be argued on the part of the City that unless Parliament had considered the rights existed, they would not have enacted to continue the Acts. No doubt the Holborn Valley bondholders had regarded the continuance of the dues as security for their loans.

Mr. *Scott*, re-called, was asked if the Corporation had considered whether there was any form of compensation which could be made for the discharge of the debt if the dues were abolished; and said he was not at liberty to state the views of the Corporation.

Mr. *Graham King* (Chairman of the Coal, Corn, and Finance Committee of the Corporation) stated that the Corporation would be prepared to accept £292,500 in settlement of the Holborn Valley debt. The Corporation were alternatively prepared to accept two years of the 4d. duty, or one year of the 8d. duty on all coal paying duty.

Mr. *J. F. B. Firth*, M.P. (Deputy-Chairman of the London County Council), said that it would be time enough to consider what course Parliament should adopt on grounds of equity and policy respecting any claims on the Corporation whenever, in the words of the Committee of 1867, "the exact extent and legal nature of the rights, if any, of the Corporation to levy such dues are ascertained and defined by a competent Court of Justice." After July 5 there would be available untaxed coal coming in by railways adequate for the supply of London. Last year there were delivered by rail 6,119,000 tons. Of that 3,875,000 tons, or more than half, came by the Great Northern and Midland Railways; and he believed that these two Companies, without the slightest difficulty to their traffic, could bring in 12 million tons. In his opinion, the ordinary statutory dues would die on July 5. With regard to sea-borne coal, he thought it was a matter of extreme doubt, which ought at any rate to be submitted to careful judicial inquiry, whether the dues on this coal existed at all. As regarded the prescriptive rights of the City, he doubted whether any creditor knew anything about them.

Mr. *Cooper* and Mr. *Scott* having been re-called on points of detail,

The Chairman announced that the Committee would not receive any further evidence.

At their sitting on the 2nd inst., the Committee decided to recommend that the Corporation should be allowed to continue for one year a duty of 4d. on coal brought into London. It was also agreed to recommend that the Corporation be allowed to retain, for the purpose of assisting in clearing off the Holborn Viaduct debt, the Kew Bridge surplus, and the drawback—the two sums together being estimated at £160,000; any sum required beyond that furnished by the 4d. duty and the surplus and the drawback to be supplied out of the City funds.

The Langley Mill and Heanor Gas Company are erecting a new gasholder, the contract for which has been let to Mr. J. Tomlinson, of Derby.

Legal Intelligence.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

MONDAY, JULY 1.

(*Before Lords Justices* COTTON, FRY, *and* LOPES.)

STRUBE *v.* SOUTHWARK AND VAUXHALL WATER COMPANY.

This was an appeal from a decision of the Divisional Court refusing a new trial of an action heard by Mr. Justice Hawkins and a jury, brought by the plaintiff against the defendants for damages for personal injuries suffered by him by reason, as he alleged, of the negligence of their servants in fixing a stopcock in a water-pipe laid to a house in a street in Walworth. The case was reported in the JOURNAL for May 14 last (p.907). The Company pleaded that they were not liable, on the ground that the occupier of the house laid down the pipe and fixed the stopcock; that it was his property; and that therefore he was liable if there was any negligence. At the trial the learned Judge nonsuited the plaintiff on the ground that there was no evidence of negligence on the part of the defendants. Against this judgment the plaintiff moved. The plaintiff, walking down the street in question, leaning on a stick, put his stick into a hole, in which was a stopcock, fell, and broke his leg. The motion for a new trial was brought on the ground that there was no evidence to go to the jury that the defendant Company were responsible for having put in or kept the unsafe box in which the stopcock was fixed. It had been agreed between the parties that if there was proved to be evidence of negligence against the defendants, a judgment should be entered for the plaintiff for £40. The defect in the fitting of the stopcock was that it was contained in an old-fashioned box, with a deep open hole to admit the key for turning the water off an on, instead of a closed box of the pattern now used. There was evidence that an officer of the Company had been seen superintending the operation of putting down the stopcock. The box was impressed with the name of the Company; and it had been supplied by the Company, who have a regulation requiring such work to be done for occupiers and owners by themselves.

Mr. FINLAY, Q.C., and Mr. M'CALL appeared for the Company in support of the appeal; Mr. COCK, Q.C., and Mr. FILLAN, for the plaintiff, opposed.

Their Lordships concurred in thinking there was evidence of negligence on the part of the defendants for which they were liable, and dismissed the appeal with costs.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, JULY 5.

(*Before Mr. Justice* STIRLING.)

THE MAYOR OF FOLKESTONE *v.* DOWNING.

Mr. GRAHAM HASTINGS, Q.C., moved *ex parte*, on behalf of the Corporation of Folkestone, for an injunction restraining the defendant from opening or breaking up the pavement in Harbour Street in that town, for the purpose of attaching to the service-pipe a screw-down stop-valve, and protecting it by a cover or guard-box. The Folkestone Water Company, by their Special Act, have power to put down these boxes; but with the view of saving themselves expense, and complying with the obligations under the Act of supplying plans, they had authorized or compelled their customers to put them down. The Corporation, being the road authorities, were responsible for the state of the roads, and if the boxes in question were not properly placed, and an accident occurred, they would be responsible. They therefore sought to restrain the defendant from doing what he had no power to do.

His LORDSHIP, upon the plaintiffs giving the usual undertaking in damages, granted an injunction over Friday next, restraining the defendant from opening or breaking up the pavement of the street for the purpose specified.

A similar injunction was granted against another person of the name of Prebble.

HIGH COURT OF JUSTICE, IRELAND—EXCHEQUER DIVISION.

SATURDAY, JUNE 29.

(*Before Baron* DOWSE.)

DUBLIN AND ALLIANCE CONSUMERS GAS COMPANY *v.* THE DUBLIN CORPORATION.

This was an action brought to recover the cost of gas supplied during four quarters by the Company to the Corporation for the lighting of the streets of the city.

Mr. MARTIN, Q.C., and Mr. A. HOLMES appeared for the Company; Mr. WALKER, Q.C., and Mr. ADAMS, Q.C., for the Corporation.

Mr. WALKER said that the two bodies had agreed that the question in dispute should be referred to arbitration. A consent was signed in the matter; and the consent stated "that the following questions be referred to the arbitration, umpirage, and award of Mr. Harry E. Jones, of London (who was nominated by the Gas Company) and Mr. A. Vernon Harcourt, of London (who was nominated by the Corporation)—an Umpire to be appointed by them under the provisions of the Common Law Procedure Acts (Ireland):—(1) What was the amount of gas supplied to defendants by plaintiffs between the respective dates hereinafter mentioned; and what were the respective sums due therefor at the respective prices hereinafter mentioned—1888, 5th of April to the 5th of July, at 3s. 6d. per 1000 cubic feet; 1888, 5th of July to the 5th of October, at 3s. 4d. per 1000 cubic feet; 1888, 5th of October, 1888, to the 5th of January, 1889, at 3s. 4d. per 1000 cubic feet? (2) Was the illuminating power of the gas so supplied of the quality with respect to its illuminating power such as to produce, when tested pursuant to the provisions of the statute at the proper testing-place, a light not less in intensity than that produced by 16 sperm candles of six in the pound; and, if not, what quantity of gas as supplied was of less illuminating power; and what damages ought to be allowed to the defendants in respect of the quantities, if any, which were so supplied of such less illuminating power? (3) Did the plaintiffs fail or neglect to provide from time to time, between the 1st of January, 1888, and the 18th of February, 1889, the public lamps with proper self-acting burners and regulators; and what sum, if any, was expended in keeping lamps and plant in repair, as referred to in the 5th paragraph of the statement of claim; and, if so, what loss did the defendants thereby sustain by waste of gas or otherwise?"

Baron DOWSE: Well, I hope there will be no more litigation now. Of course, the Corporation and the Company can spend respectively as much as they like of the citizens' and shareholders' money in fees, as far as I am concerned. In saying that, I do not mean to refer to Mr. MacSheehy (the Law Agent to the Corporation), who, of course, will get no benefit by litigation, but only additional trouble, and perhaps abuse, which I see he is getting at present—very unjustly, unless he is greatly changed indeed from what he was when I used to know him.

Mr. WALKER said there was an agreement also as to an arbitration regarding the future; and they had submitted to the Gas Company a consent for an arbitration on that matter, which consent in fact was embodied in a letter of the Company, but the Company had not yet accepted it.

Mr. MARTIN said this matter had nothing to do with the present case, and should not be referred to.

Mr. WALKER said it had reference to the future price of the gas, the position of the testing-stations, and facilities for testing.

The consent signed by the solicitors on both sides was then made a rule of Court.

MESSRS. R. DEMPSTER AND SONS, of Elland, have just received an order to carry out some important extensions of the purifying plant at the Chorley Corporation Gas-Works, under the supervision of the Engineer (Mr. W. Blackledge.) The contract consists of six 20-feet square purifiers, carried on a complete superstructure, with 20-inch valves and connections, lifting appliances, elevators, &c. They are also about to alter ten 33-feet by 19-feet purifiers at the Meadow Lane Gas-Works of the Leeds Corporation. Among other gas-works plant which they have had instructions to supply is a rotary exhauster for the Formby Gas-Works.

THE EXTENSION OF THE BRADFORD WATER-WORKS.—At their meeting yesterday week, the Consulting Sub-Committee of the Bradford Corporation Water Committee agreed upon their report on the alternative Grimwith and Nidderdale schemes for increasing the Bradford water supply. It is reported that they decided to recommend the adoption of the Nidd scheme. It was also resolved that printed copies of the various reports on the subject should be placed in the hands of the members of the Water Committee at an early date; and the full Committee will subsequently meet to deal with the recommendations of the Sub-Committee.

FATAL FIRE AT A TAR DISTILLERY.—Last Thursday night a shocking fire occurred at the works of Messrs. Forbes, Abbott, and Lennard, manufacturing chemists and tar distillers, at Ordnance Wharf, East Greenwich. One of the tar-stills, containing about 50 gallons of tar, took fire. It blazed up with fearful intensity; and the burning tar, boiling over, enveloped one of the workmen, named John Creasy, 36 years of age, who was instantly burned to death almost in front of his comrades' eyes. The workpeople put in operation a private stream kept on the premises, and the flames were eventually subdued, though not until considerable damage had been caused to the contents of the yard.

NORMANTON LOCAL BOARD WATER SUPPLY.—Negotiations have been going on for some time between the Normanton Local Board and the Special Sub-Water-Works Committee of the Wakefield Town Council respecting a supply of water by the latter to the Normanton district. The Wakefield Committee are anxious to get the matter settled, and have now sent in their final offer, which is as follows:—To deliver the water into the Board's reservoir at Marshall Hill, 125,000 gallons to 150,000 gallons per day, at 8d. per 1000 gallons; 150,000 gallons or more, at 7½d. per 1000 gallons—the maximum quantity to be double the minimum. The matter was before the Local Board at their meeting yesterday week; but it was agreed to deal with it in Committee.

NORTHERN COAL TRADE.—There was last week a rather better demand for coal in the North of England; and the price was fully maintained. For best Northumbrian qualities, the price now varies from 9s. 6d. to 9s. 9d. per ton, free on board in the Tyne; and all the collieries are well employed. For second-class coal the demand is scarcely so good; and some of the pits are not quite fully occupied. For gas coal there is a rather better inquiry; and some local contracts are being placed at advanced prices. One Tyneside firm has also booked a contract for the supply of coal for the Limerick Gas-Works, and at prices which are fair, if the existing rates of freight continue. The price of gas coal is 8s. per ton, less 2½ per cent., free on board in the Tyne; but much is contracted for at lower prices.

GAS CONSUMERS AND THEIR CONTRACTS.—At the Westminster County Court last Thursday, Mr. C. Steel, formerly landlord of the Britannia Arms, Bishopsgate Street Without, was summoned by The Gaslight and Coke Company for £8 4s. 3d. for gas supplied to the premises, and 9s. 6d. the rent of a stove. The defendant disputed the claim on the ground that he had served notice on the Company to discontinue the supply of gas. Their Solicitor, however, stated that, although every possible inquiry had been made, no letter such as it was stated had been sent could be found. His Honour decided that, as there was no direct evidence of the contract between defendant and the Company having been cancelled, judgment must be given for the plaintiffs for the amount claimed, with costs; to be paid within a week.

THE REMUNERATION OF THE ENGINEER OF THE STOCKTON GAS-WORKS.—A liberal addition to the salary of Mr. W. Ford, the Engineer of the Stockton Corporation Gas-Works, was made, on the recommendation of the Gas Committee, at the meeting of the Council last Tuesday. Mr. Ford's remuneration stood at £500; and the increase amounts to £150, with a further £50 when the sulphate of ammonia works are started. In moving the confirmation of the Committee's recommendation, Alderman Richardson remarked that the subject was considered by a large number of the Committee, who came to the unanimous decision that Mr. Ford was entitled to this increase. For himself, he was surprised that Mr. Ford had not made the application much sooner. Mr. Samuel inquired how long it was since Mr. Ford received an increase? Mr. Kindler replied that he had had only one increase in 20 years. Mr. Bainbridge thought that if they were to obtain additional vigilance by giving Mr. Ford the increase, they might reasonably apply the same argument in giving a rise to their workmen at the gas-works, some of whom, ten years ago, had their wages reduced 2s. per week; and this reduction was still in force.

THE NEW PRESTWICH RESERVOIR OF THE MANCHESTER CORPORATION.—A material check has been placed upon the progress of the excavations in connection with the new reservoir works now being carried out at Prestwich for the Manchester Corporation. On Monday of last week nearly the whole of the men engaged on the work, numbering about 100, turned out on strike, in consequence of the Contractors, Messrs. Kirk and Knight, declining to accede to a demand of an increase of ¼d. an hour in the wages of the navvies. Up to the time of the strike, the men were receiving 4d. an hour, working about 60 hours a week. The increase would thus mean an addition of 2s. 6d. to the wages of the men. The Contractors anticipate that before very long the men will return to work at the old rate; but some of the men, on the other hand, declare that for their part they will not recommence on the excavations until an increase is offered by the Contractors. Meantime, Messrs. Kirk and Knight have only a small number of men engaged on the works. Up to this time the work of forming the new service reservoir has been going on very satisfactorily; and the Contractors hope, considering the satisfactory progress made in connection with the operations during the winter, that the works will be completed in about three years from the time the construction of the reservoir was commenced last year.

Miscellaneous News.

THE GAS AND WATER PROVISIONAL ORDERS FOR THE PRESENT SESSION.

The Board of Trade have issued Memorandums stating the nature of the proposals contained in the Provisional Orders included in the Gas Provisional Orders Bill and the Water Provisional Orders Bill, which are now before the House of Commons.

The first-named Bill comprises the Orders relating to Buckley, Market Rasen, Melton Mowbray, Romford, and Warminster. The Buckley Order is to empower the Buckley Gas Company, Limited, to construct and maintain gas-works, and to make and supply gas within parts of the parishes of Mold and Hawarden, both in the county of Flint; also to fix the capital at £5000 by shares and £1250 by loan, and the maximum price to be charged for gas at 5s. 6d. per 1000 cubic feet. The Market Rasen Order is to empower the Market Rasen New Lighting Company, Limited, to maintain and continue their existing gas-works, and to make and supply gas within the parish of Market Rasen and parts of the parish of Middle Rasen, both in the county of Lincoln; and to fix the capital at £5500 by shares and £1375 by loan, and the price to be charged for gas at 5s. per 1000 cubic feet, with sliding scale as to price and dividend. The Melton Mowbray Order is to empower the Melton Mowbray Gaslight and Coke Company, Limited, to maintain and continue their existing works, and to make and supply gas within the parishes of Melton Mowbray and Thorpe Arnold, both in the county of Leicester; and to fix the capital at £22,000 by shares and £5500 by loan, and the price to be charged for gas at 4s. per 1000 cubic feet, with sliding scale as to price and dividend. The Romford Order is to empower the Romford Gas and Coke Company, Limited, to construct and maintain additional works, and to raise £13,000 further capital by shares and £3750 by loan; and to fix the price to be charged for gas at 4s. 6d. and 4s. 9d. per 1000 cubic feet respectively within certain areas, with sliding scale as to price and dividend. The Warminster Order is to empower the Warminster Gas and Coke Company to maintain and continue their existing works, and to make and supply gas within the parishes of Warminster and Bishopstow, both in the county of Wilts; and to fix the capital at £12,000 by shares and £3000 by loan, and the price to be charged for gas at 4s. per 1000 cubic feet, with sliding scale as to price and dividend. The Memorandum in respect to these Orders states that the additional capital authorized is in all cases required to be offered for sale by auction or tender. The usual clauses as to limits of dividend, the creation of insurance and reserve funds, the testing of the gas, the quantity of land to be taken by agreement, &c., have been inserted, and the Gas-Works Clauses Acts, 1847 and 1871, incorporated. In all the Orders the illuminating power has been fixed at 15 candles.

The Water Provisional Orders Bill comprises the Orders relating to Brightlingsea, Corsham, Faversham, Harpenden, and Llandrindod Wells. The Brightlingsea Order is to empower the Brightlingsea Water Company, Limited, to maintain and continue their existing works, and supply water in the parish of Brightlingsea, in the county of Essex; to supply water in bulk by agreement within or without the limits of supply; and to fix the capital at £5000 by shares and £1250 by loan. The Corsham Order is to empower the Corsham Water-Works Company, Limited, to construct and maintain water-works, and supply water in the parishes of Corsham, Pewsham, and Lacock, all in the county of Wilts.; to supply water in bulk by agreement within or without the limits of supply; and to fix the capital at £4000 by shares and £1000 by loan. The Faversham Order is to empower the Faversham Water Company, Limited, to maintain and continue their existing works, and to supply water in the parishes of Faversham, Preston (including the Brents), Ospringe, Oare, Davington, and Goodnestone, all in the county of Kent; to supply water in bulk by agreement within or without the limits of supply; and to fix the capital at £18,000 by shares and £4500 by loan. The Harpenden Order is to empower Messrs. J. R. Brown, of Harpenden, and E. A. and H. Cumberland, of Luton, to maintain and continue the existing works, and to supply water in the parish of Harpenden, in the county of Hertford; to supply water in bulk by agreement within or without the limits of supply; and to fix the capital at £9000 and the amount to be borrowed at £2250. The Llandrindod Wells Order is to empower the Llandrindod Wells Water Company to raise £1000 of additional capital by shares or stock, and £500 by loan. The fresh capital authorized is in all cases required to be offered for sale by auction or tender. The rates which may be charged for the supply of water for domestic purposes are to be based upon the rateable value of the houses, as ascertained by the valuation list; and the usual clauses as to regulations for preventing waste, misuse, or contamination of water, as to the supply of water by measure, and as to the quantity of land to be taken by agreement, &c., have been inserted. The Water-Works Clauses Acts, 1847 and 1871, have been incorporated in each case.

THE LIGHTING OF THE CITY OF DUBLIN.

HOURS OF STREET LIGHTING—THE RECENT BOARD OF TRADE INQUIRY—A GAS-METER TESTING-STATION.

The Monthly Meeting of the Dublin City Council was held yesterday week—Mr. Alderman KERNAN, *locum tenens*, presiding—when various matters connected with the lighting of the city were brought before the members.

Mr. DENNEHY handed in the two following notices of motion:—(1) "Councillor Dennehy will call attention to the serious complaints of the citizens and also in the press of the system recently adopted by the Sub-Gas Committee of the Paving and Lighting Committee of extinguishing the gas-lights in the street some hours before the usual time, and by so doing leaving the city during some hours of the night in utter darkness; and will move that, as under the 63rd Section of the Special Act of this Corporation 'it is mandatory on the Council to pave and light the city,' the non-performance of such duty would in case of any accident occurring thereby, involve the members of this Corporation in serious personal liability." (2) "Councillor Dennehy will call attention to the fact that during the past year several Sub-Committees have been appointed by the Council, with reference to the gas lighting, electric lighting, and the consolidation of the municipal debts or loans, as well as the constructions of markets; that these Committees have not reported with respect to the duties discharged or to the payments made to this Council, as required by law; and will move that the several Committees named do furnish full reports to the Council of all action taken and all payments of money made by them up to the present date with the least possible delay."

The TOWN CLERK stated that the Board of Trade had forwarded the report of Major Marindin in reference to the recent inquiry into the application of the Dublin and Alliance Consumers' Gas Company for powers to open the streets for the purpose of supplying electric light to the St. Stephen's Green area. The report, which was a lengthy one, stated on the subject of capital that, even if it were held that the refunded sums should be considered as old capital, which was somewhat doubtful, the amount actually available for electric lighting, as estimated by Mr. Kean, the Auditor for the Board of Trade, was only £10,000; and this sum was inadequate for an undertaking which was estimated to cost £15,882. The power to break up the streets would, if granted, place the Gas Company in a far better position than any other Electric Lighting Company in the kingdom, and in a position which he could not think was contemplated by Parliament or the Board of Trade. In conclusion, the Inspector said: "I have to report that in my opinion, it is not expedient for the Board of Trade to accede to the request of the Dublin and Alliance Consumers Gas Company to exercise their power under the Act of 1883, by giving permission for the breaking up of the streets by the Company for the purpose of electric lighting."

Alderman MEAGHER proposed that these communications be referred to the Electric Lighting Committee, and that they be empowered to take such action in reference thereto as the interests of the city might require.

Alderman BYRNE seconded the resolution.

Mr. DENNEHY argued that the finances of the city would not warrant the Council in going into any extra expenditure on electric lighting.

The motion was carried.

Alderman PERRY moved the adoption of a report of the Special Gas Committee, recommending the erection at Tara Street of a new gas-meter testing-station, and public lighting department. It was, he said, a very desirable improvement, and one which the Board of Trade had called attention to as necessary for the preservation of some very valuable standards, of which there were only three in the kingdom. The present building was in a most dilapidated condition.

Alderman BYRNE seconded the resolution.

Mr. SHANKS observed that an expenditure of £3000 was proposed; and some stronger case should be made out for it than what the Committee had put forward. He moved that the consideration of the report be postponed for three months.

Mr. DOYLE seconded the amendment.

Mr. DENNEHY maintained that this expenditure was unauthorized by law, and the money was not available.

Alderman MEAGHER believed it was inopportune for the Council at present to incur this expense.

Alderman BYRNE said that until the testing-station was moved to some place under the complete control of the Corporation, the citizens could have no confidence in the testing. He could not understand this opposition, which was championing the Gas Company.

Mr. SHANKS protested against the imputation that he was a champion of the Gas Company.

The CHAIRMAN held that as the Gas Company were contractors to the Council, to charge a member with championing them was a breach of order.

Mr. LENEHAN remarked that £3000 was a mere bagatelle compared with the amount of money that probably could be saved by adopting the report.

Alderman PERRY said that the condition of Hanover Street testing-station was scandalous. The meters frequently had to be cleaned from rust; there was no shelter for the *employés;* and the station was the worst in the three kingdoms. He asserted that there was £14,000 available, out of which the cost of this building could be legitimately paid.

The CHAIRMAN said the city of Dublin was heavily pressed with taxes, and he was not inclined to see them increased. It would be wiser to postpone this erection for a time, for they might require an elaborate structure for electricity; and they could put this department in the palatial building that he supposed would be erected.

Mr. ROBINSON here gave notice that he would move that the vote of any shareholder in the Gas Company should be disallowed under the new bye-laws.

On the amendment being put, 6 voted for it, and 18 against it.

Mr. DOYLE moved, as a further amendment, that the sum of £3000 be erased from the report, and £1000 be substituted for it, as the amount to be expended on the new testing-station.

Mr. SMYTH seconded the amendment.

Mr. M'DONNELL said that he entered the Council desirous of doing some practical work; but he found their time was wasted day after day with "gas."

Mr. ROBINSON said in 1882 a Committee reported against the Hanover Street station; but the influence of the Gas Company had been so strong, and it had been exercised in such a manner, that from that day to this the Corporation had not been permitted to erect a new testing-station. The testing of gas up to the appointment of the present Inspector was a perfect sham.

The amendment was put and declared lost.

Mr. DENNEHY proposed as an amendment—"That, until the result of the action-at-law between the Corporation and the Gas Company be terminated and this question decided, the report be not adopted."

Mr. SMYTH seconded the amendment.

The CHAIRMAN ruled that this amendment was out of order.

The resolution moved by Alderman Perry was then put and carried unanimously.

Mr. DENNEHY gave notice that at the next meeting he would move that the resolution be rescinded.

THE PROJECTED ELECTRIC LIGHTING INSTALLATION AT LEEDS.

At a Special Meeting of the Leeds Town Council last Wednesday—the MAYOR (Alderman Ward) presiding,

Mr. LEE HARDWICK moved that the Council authorize the lighting by electricity of such portions of the Town Hall and Municipal Buildings mentioned in the report of the Electric Lighting Committee (the summary of which has already appeared in the JOURNAL), at an estimated expenditure of £3000.

Alderman SPARK seconded the motion.

In the course of the discussion which ensued, it was pointed out that £3000 seemed a large sum, inasmuch as the Fine Art Gallery and the Free Library were already lighted by electricity, and that the Corporation possessed the plant which was required for the more extensive installation contemplated.

Mr. WILLEY remarked that the actual expenditure might not be more than £2500.

Mr. GILSTON observed that it seemed to him that the Committee had not a very clear idea as to what they were about to do.

Mr. HARDWICK said all that was required were the additional lamps and the wires, &c., for the proposed extension.

The resolution was unanimously adopted.

Mr. HARDWICK next proposed—"That the Council apply to the Board of Trade for a Provisional Order under the authority of the Electric Lighting Acts, 1882 and 1888, authorizing the Corporation, as the Local Authority under the Acts, to provide and supply electricity for public and private lighting purposes within the area referred to in the report, at an estimated total capital expenditure of £66,000 and that the Town Clerk, in conjunction with the Electric Lighting Committee, be authorized and empowered to take all necessary legal and other proceedings, and to give

the notices on behalf of the Council, which may be necessary in connection with the application to the Board for and obtaining such Provisional Order." He remarked that electricity had now reached a stage which warranted the Corporation undertaking the step proposed. The question was whether they should undertake to supply the electric light, or allow companies to come in to do so instead.

Alderman SPARK, in seconding the resolution, stated that the cost of electric lighting was now ½d. per lamp per hour. He strongly urged that the Corporation should not allow the supply of electric lighting to pass out of their hands.

Mr. BATTLE moved an amendment, to the effect that it was not desirable for the Corporation to supply electricity for public or private lighting purposes, as in the opinion of the Council such supply could be advantageously provided by private enterprise. No evidence had been produced to convince the Council that, in passing the resolution, they would be undertaking a profitable concern. In fact they were asked to embark in an enterprise of a most speculative character; and there was not a single member of the Committee who supported it who would invest his own money in it if it were to be carried out by the Electric Lighting Committee. If he were to put money into it, he should regard it as a "permanent investment," for he should never expect to see any return (laughter). They need not have any fear that the town would not be provided with the electric light. He pointed to the large amount of money which had been invested in electric lighting, and which had been practically lost; and said he could not, in fact, understand intelligent business men undertaking such a scheme for a moment.

Mr. GORDON seconded the amendment.

Mr. ARNOLD LUPTON spoke strongly in favour of the motion.

After considerable discussion, the amendment was lost.

Mr. KETTLEWELL then moved another amendment, to the effect that the question be referred back to the Committee to report further, especially as to the annual cost of the present installation, and as to the cost in other towns where the electric light has been adopted.

This amendment having been seconded, was adopted.

THE PROPOSED ELECTRIC LIGHTING OF BRISTOL.

A few weeks since Mr. W. H. Preece met the Bristol Sanitary Committee, and discussed with them the feasibility of lighting the city by means of electricity. After a long conversation, it was decided that Mr. Preece should prepare a report on the subject; and this report has been issued to the members of the Electrical Committee, accompanied by a letter intimating that the contents of the report should not be disclosed until it had been dealt with by the Committee. Nevertheless a local paper has published an epitome thereof. It refers to what has been done in other towns in the matter of electric lighting, and to the results that have been obtained. Mr. Preece admits that electricity cannot compete on very fair terms with gas, as it cannot be supplied as cheaply as gas. His experience in the London Post Office was that a gas-burner giving a 10-candle light cost about 18s. per annum, and an electric lamp furnishing the same amount of light cost 22s. per annum. That might be taken, Mr. Preece says, as the difference in cost. His view is that the electric light is undoubtedly the light of the future. He does not, however, anticipate that it will do the least harm to gas, because there are various means to which gas can be applied. He supplies numerous statistics of the installations elsewhere. The only Corporation which has undertaken electric lighting is that of Bradford; and as they have had no experience of the management of the light, Mr. Preece thinks it behoves the Bristol Corporation to consider the matter very carefully indeed. He says there are advantages in the Corporation undertaking the matter, because they could get the money on advantageous terms, the light could be supplied at the lowest price to the consumer, and any profit arising could be applied to the reduction of the rates. He seems to favour the alternate current system.

RECENT SALES OF SHARES.

Last Wednesday, Messrs. Fox and Bousfield sold at the Auction Mart, Tokenhouse Yard, E.C., a quarter of a King's Share, a 120th part of an Adventurer's Share, and 25 £100 new shares in the *New River Company;* and 200 £50 new ordinary shares (with a maximum dividend of 7 per cent.) in the *Grand Junction Water-Works Company.* The quarter of a King's share was offered in fractions, and sold as follows:—The first lot, consisting of a 100th part of a share, realized £1000; and the succeeding lots, each composed of a 120th part, fetched: Three, £790 each; two, £780; one, £770; one, £760; one, £750; three, £740; five, £735; and three, £730. The 120th part of an Adventurer's share produced £810. Of the new shares, 1 sold at £365; 3, at £364 each; 2, at £362 each; and 19, at £360. The new shares in the Grand Junction Company were disposed of at the following prices:—26, at £91 each; 24, at £90 15s.; 32, at £90 10s.; 76, at £90; 10, at £89 10s.; and 32, at £89.——Some *Preston Gas Company's* "A" stock was lately sold at £206 and £207, and "B" stock at £152 per cent.——At Sunderland, a large number of shares in the *Sunderland and South Shields Water Company* were recently exposed for sale by auction. The first shares offered produced from £11 14s. to £11 16s. per share. Thirteen shares, valued at £65, of 7½ per cent. preference stock, were put up in one lot, and were disposed of at £11 17s. each. There were next offered 484 fully-paid shares allotted in 1875; and these were sold at from £6 15s. to £6 16s. The total amount realized by the sale was £4876.——At Pudsey yesterday week, Mr. H. Gott sold by auction several lots of gas shares and stocks in the *Eccleshill and Bolton*, the *Calverley and Horsforth*, and the *Harrogate Gas Companies.* Some fully-paid £10 shares in the first-named Company (paying 8 per cent.) were offered in lots of ten shares each, and realized from £186 to £188 per lot. A lot consisting of 15½ shares was disposed of at £291; and a further lot comprising 14½ "B" shares of £10 each (£8 per share paid up) fetched £215. The next lot consisted of £171 original 10 per cent. stock in the Calverley and Horsforth Gas Company, and sold for £380; and £50 worth of 7 per cent. stock realized £92. Six shares, 7 per cent. stock, but only £2 paid up, sold for £34 5s. Three lots of "A" stock in the Harrogate Gas Company—viz., two of £50 each and one of £60—sold for £157, £157, and £191 respectively.

WOKING ELECTRIC SUPPLY COMPANY, LIMITED.—In the JOURNAL for the 11th ult., we notified the establishment of this Company; and in connection with the statement then quoted from a local contemporary—that a "fair demand" had been made for allotments of shares—the following paragraph from the *Surrey Advertiser* will be of interest: "The promoters of the scheme for supplying the Woking district with the electric light have returned the money which was subscribed for shares in the proposed public Company. The matter, however, will by no means be allowed to fall through. The original seven signatories will now constitute the Company; and the necessary preliminaries for the establishment of the works will be proceeded with at once."

GAS AND WATER WORKS FOR GORING AND STREATLEY.

THE PROGRESS OF THE UNDERTAKING—A FRESH ISSUE OF CAPITAL.

Our readers may remember that among the Provisional Orders of last session was one granted to the Goring and Streatley District Gas and Water Company, Limited, to authorize them to construct works and supply gas and water in the places named in the title and in the adjacent district. As soon as the Order was granted, the Company's Engineer (Mr. Jabez Church, M. Inst. C.E., F.G.S., of Westminster) proceeded to prepare the necessary plans; and the contract for the erection of the works was entrusted to Messrs. J. and H. Robus, of Walbrook and Horley, who are now constructing works for the Mid-Sussex Water Company at Balcombe, under the same Engineer. A start was made a few weeks ago; and last Tuesday the site (which is just outside Goring) was visited by some of the Directors and officials of the Company. The Chairman (Mr. E. Walmisley, a Director of the Brentford and Hornsey Gas Companies) was unable to be present; but other members of the Board (Messrs. A. Green, R. Fish, and G. E. Martin) attended, accompanied by the Secretary (Mr. W. H. Hardy, F.C.A.), the Engineer (Mr. Church), and Mr. H. J. Robus, representing the Contractors. On reaching the works, it was found that good progress had been made. The Manager's house is almost ready to be roofed in; the retort-house, which is to contain three benches of retorts on the regenerative system, capable of producing 50,000 cubic feet of gas per day, is in a forward state; the tank is ready for the gasholder; and the station meter and governor are in position. The condensing and purifying plant, and the various accessory appliances of gas manufacture (which are all of the most approved type) will shortly be on the ground, and everything ready for sending out a supply of gas in the course of next month. The well is sunk to a depth of 100 feet; and with a deep boring into the chalk, an abundant supply of water has been obtained, which upon analysis by Dr. Attfield, F.R.S., proves to be of first-class quality. The reservoir, which will be circular in form, and capable of holding 100,000 gallons of water, will be commenced during the present week. It is fully expected that the much-needed supply of good water—the district being now solely dependent upon wells—will be available in September. The locality in which the works are situated is one of the most picturesque on the banks of the Thames; and, being within easy reach of Oxford and Reading, high-class residential property is rapidly springing up. This fact has been duly considered by Mr. Church, who, in designing the works, has so arranged the buildings and plant that they can be added to as part of the original design, as may from time to time be required. He has also been careful to make them harmonize as much as practicable with the buildings in their vicinity. With regard to the Company's prospects, there appears to be an excellent field for the introduction of gas for lighting purposes; and now that its advantages as a fuel for culinary operations are recognized, a large demand for it for this special use will in all probability arise. As to the other branch of the Company's business, the superiority of a service of good water, constantly under pressure, to the present indifferent supply from wells must commend itself to every resident. By an advertisement which appears in another part of the JOURNAL, it will be seen that the Directors are inviting applications for the unallotted shares in the Company. We wish them every success.

STOCKPORT CORPORATION GAS SUPPLY.

PROPOSED EXTENSION OF THE WORKS.

At a Special Meeting of the Stockport Town Council last Wednesday, the Mayor (Mr. Joseph Leigh), in moving the adoption of the minutes of the Gas Committee, drew attention to the following paragraph:—"The Engineer submitted drawings and specifications for a new gasholder tank at the Portwood works, stating that, in consequence of the steady increase in the consumption, it is imperative that prompt measures be taken to keep up with the demand. The drawings submitted were for a tank to receive a gasholder of 1,000,000 cubic feet capacity. The construction of this tank and the erection of a gasholder will occupy nearly 18 months. The Committee, having carefully gone through the drawings and visited the site of the proposed tank, resolved:—'That the drawings and specifications of a new gasholder tank prepared and submitted by the Engineer be received and adopted, and that advertisements be inserted in the usual papers for tenders, the same to be submitted at the Committee's meeting held July 10.'" Proceeding, the Mayor said the Committee were satisfied that the time had come when they should begin to make preparations for increasing the gas storeage accommodation. In one day last year the gas contained in both the holders was consumed in 19 hours; and such a small storeage proved costly to the Committee, who ought to have capacity for 24 hours' supply. The Committee felt it absolutely necessary to commence the work of extension without further delay, as, under the most favourable circumstances, they could not expect to have it completed before the end of next year. If not done now, they would be much pinched in future. Alderman Johnson seconded the motion; and the minutes were confirmed.

BURY CORPORATION GAS SUPPLY.

THE ENGINEER'S ANNUAL REPORT.

The annual report of the Gas Engineer of the Bury Corporation (Mr. W. Woodward) was presented at the meeting of the Town Council last Thursday, and was adopted without comment. We find therefrom that, although the trade of the town is not in so flourishing a condition as could be desired, and although many large works are closed, the increase in the consumption of gas has been very considerable—viz., 12,760,490 cubic feet, or 5·8 per cent. Gas made (as per station meter), 248,455,000 cubic feet; gas sold for private consumption, 212,163,100 cubic feet; gas sold for public lighting, 20,585,190 cubic feet; gas used on the works and for public clocks, 2,771,800 cubic feet; loss through leakage, condensation, &c., 12,984,910 cubic feet, or equal to 5·22 per cent. The loss in the previous year was 5·79 per cent. During the past year the Lighting Committee connected 25 new lamps to mains, making a total of 1806 lamps. The average illuminating power was 18·2 candles; the parliamentary standard being 12 candles. During the year, 898 yards of new cast-iron main pipes were laid, and 203 new services put into buildings. A very important piece of work was executed during the year—viz., a survey of the streets was made, and all the gas-mains in the town traced and entered thereon. Coke proved itself a great drug, and prices consequently fell 33 per cent. Tar showed a marked improvement in value. Sulphate of ammonia prices were not so well maintained; but, although a larger quantity of this fertilizer was made, the expenses of manufacture slightly decreased. The cost of manufacture, distribution, and management, per 1000 cubic feet of gas sold, was 2s. 1·4d.; less tar, sulphate, coke, sundries, meter rents, &c., 8·6d.—1s. 4·6d. The estimate as to the cost of gas for the current year is: Manufacture, distribution, and management, £26,000, or 2s. 2·6d. per 1000 feet of gas sold; less tar, sulphate, coke, and sundries, 9·2d., or 1s. 5·4d. per 1000 feet; add interest on loans and stock and sinking fund, 7d.; or equal to 2s. 0½d. per 1000 feet of gas sold.

MANCHESTER CORPORATION GAS SUPPLY.

THE ELECTRIC LIGHT—A NEW FIELD OF ACTION FOR MR. ELLIS LEVER.

At the Monthly Meeting of the Manchester City Council last Wednesday—the MAYOR (Mr. Alderman Batty) presiding,

Alderman LAMB, the Chairman of the Gas Committee, moved the adoption of the proceedings of the Committee.

Alderman Sir JOHN HARWOOD seconded the motion, and referred to some remarks made by Mr. Murray at a previous meeting in regard to the accounts. The matter had been referred to the Auditors, who had audited the accounts, and passed eulogiums on the keeping of them, and shortly they would have their answer. He thought, however, that before any gentleman in the Council condemned the accounts, he should first have seen them. With regard to the electric light, they would have to discuss the matter at a special meeting of the Council. The interests of the citizens were not being neglected. It was proposed to hold a special meeting of the Council on the 7th of August for the purpose of adopting a resolution authorizing an application for a Provisional Order, empowering the Corporation to introduce electric lighting in the city, and the matter would then be fully discussed.

Mr. MURRAY replied at a later stage to the remarks of Sir John Harwood, and said that he had not referred to errors of book-keeping, but to the system. He had made no reflection on the Superintendent or the book-keeper.

The resolution was agreed to.

Alderman Sir JOHN HARWOOD stated that a sense of duty compelled him publicly to call attention to a matter of importance. He wished to say he would rather hurt himself than do anything which would be grieving to the Mayor; but he thought when he had explained, they would see he was right in bringing the matter forward. A letter came to the Town Hall, addressed to the Mayor, when he was away from home, which was said to be marked "private." But the letter was opened and presented to him (Sir John) at the gas office. When he read the letter, he said the time had come when the matter must be taken up; and he would not permit it to stand over any longer. When he was Mayor he received a letter from the same writer, intimating that he did not want to make public something that he knew. Then the gentleman in question sent Mr. Fox Turner to him, to see if he would have any conversation with him. He said: "No, I will not. If this coward chooses to attack my character, let him publish anything he likes. I defy him; let him publish what he likes. I will not hold any intercourse with him until he publishes or sends me an apology." He refused to give up the letter, on the ground that if he did so the gentleman might tell people what he liked; and he (Sir John) would have no witness. He was now going to read the letter that was addressed to the Mayor. The Mayor said it was "private." His reply was: "A man is not going to call me a thief in a private letter to you. This letter having come to me, I have no alternative but to take it up." The letter was as follows:—

Colwyn Bay, June 7, 1889.

The Worshipful the Mayor of Manchester.

Dear Sir,—Before any of the contracts for coal and cannel are confirmed by the City Council, I wish, with your permission, to make a statement in reference to the dealings of the Gas Committee, and especially of certain members of it, whose connection with at least one contractor is not of a character calculated to benefit the ratepayers, nor fair to other contractors. It is quite time that the Council should know what has been going on for some time, and how my firm has been treated by the Gas Committee.—Yours faithfully, (Signed) ELLIS LEVER.

He would tell the Council how cruelly Mr. Lever's firm had been treated. In the past month, the firm received £8600 from the Gas Committee. From March, 1888, to March, 1889, this abused firm received £88,500; and between 1877 and 1889 they received upwards of a million of money from the Committee. If members of the Committee were not honest, they should be branded as dishonest men. He had no connection, and never had, with any contractors. It was his duty to himself and his family to guard his own character. Members of the Committee were, however, charged collectively with doing something and with being something. Of course, he ought, at the same time, to read a sort of withdrawal or apology from Mr. Lever, which was as follows:—

Culcheth, Bowdon, Cheshire, July 2, 1889.

The Worshipful the Mayor of Manchester.

Sir,—On the 7th ult., I wrote you a private and confidential letter from Wales, which was addressed to you at the Town Hall and endorsed "private and personal." It was intended for you alone; but it was opened, and, I learn, copied, in your absence, before it reached your hands. Under these circumstances, I now withdraw that letter, and express my regret for having troubled you with it.—Yours faithfully, (Signed) ELLIS LEVER.

If the Council had honest men administering their affairs, it was their duty to protect them. This was a kind of intimidation which must be resented; and he maintained that a private letter to the Mayor withdrawing an abusive letter like the one he had read was not enough. He therefore moved that the Town Clerk be requested to call on Mr. Lever to prove his allegations, and, failing that, to take such steps as would vindicate the character of the Gas Committee.

Alderman READE, seconded the motion, and said he thought Sir John Harwood had only done his duty in moving such a resolution.

Mr. MARR said they would agree that this was an exceedingly serious charge to make against individuals and against a Committee of the Corporation. But it was the habit of this gentleman to make such charges; and he thought the best way would be to put both the letter and the apology into the waste paper basket. (No, no.) That was what he thought ought to be done; but if a different view were taken, he thought they would all like to vindicate the character of the Committee, though he regretted the serious view that was taken of the matter.

Alderman THOMPSON supported the motion. He said he had not always agreed with Sir John Harwood; but that did not detract from the great respect he felt for his integrity and industry. If there was a gas department conducted on sound principles, financially and morally, it was that of the Manchester Corporation. He had the privilege of serving on the Committee many years ago; and he knew every precaution was taken to safeguard the interests of the town. He believed that feeling was as strong to-day as it was 15 years ago; and it would be necessary to take some notice of this matter. The public were very sensitive about such things; and after the recent scandals in the neighbourhood, there would be plenty of people ready to say the same thing went on in Manchester as elsewhere.

Alderman WINDSOR thought the Council were bound to defend the Gas Committee. Some years ago the Council appointed a Special Committee to consider the mode in which each Committee protected the interests of the Council. He acted on that Committee; and he was bound to say that with regard to the Gas Committee, they were unanimously of opinion that the accounts were admirably kept and that the precautions against fraud in every direction were simply perfect.

The MAYOR felt it due to himself to say that the letter addressed to him by Mr. Lever, and marked "private," was opened in his absence, and went into the Town Clerk's office. There a copy was taken of it; but with that he found no fault at all. His first step on getting such a letter would have been to submit it to the Town Clerk, and ask his opinion. But the matter was taken out of his hands. He did not wonder that when the letter was submitted to the Gas Committee, it caused great indignation For himself he would help his colleagues in any way he could in the matter. He hoped that the Council would not blame him in regard to what had occurred. He thought it would be found that Mr. Lever had been misled, and that the allegations he had made would be withdrawn so as to satisfy Sir John Harwood and the Gas Committee.

The resolution was unanimously carried.

HALIFAX CORPORATION GAS SUPPLY.

THE COAL CONTRACTS—THE GAS SCANDAL.

At the Monthly Meeting of the Halifax Town Council last Wednesday—the MAYOR (Alderman Booth) presiding—the above matters came before the members. The confirmation of the minutes of the Gas Committee having been moved and seconded,

The MAYOR alluded to a question put at the last Council meeting, with reference to the acceptance of the tender of Messrs. Milnes, Stansfield, and Co., as to whether it was true a lower tender was sent in by Messrs. Newton, Chambers, and Co. He did not answer the question at the time, because he was not then in possession of the facts bearing on the case; and he now entered into an explanation showing that in consequence of Messrs. Newton, Chambers, and Co. having raised the price of their coal 2s. 1d. per ton, whilst Messrs. Milnes, Stansfield, and Co. had only raised their price 1s., the latter was the cheaper. He further mentioned, in reply to Alderman Riley, that the price in Messrs. Newton, Chambers, and Co.'s tender for coal this year was 9s. 10d. per ton; and the tender of Messrs. Milnes, Stansfield, and Co. 10s. 2d.

The minutes were adopted.

The next item on the *agenda* paper was—"To receive a report from the Gas Scandal Sub-Committee, and to pass such resolutions thereon as the Council shall deem expedient."

Alderman RAMSDEN said the notice of motion had been put on the *agenda* in all good faith; and with a view to fulfil a promise which was contained in the notice, he had prepared a draft, which was at the present time only in draft, but substantially the report which it was originally intended to submit to the Council But within the last few days, communications and correspondence had taken place between the Sub-Committee and Mr. T. K. Fox; and until the Sub-Committee were able to come to some issue with Mr. Fox regarding the matter, they were of opinion that it would be judicious for them to withhold the report. The report would necessarily be incomplete unless they could state something with respect to the interviews with Mr. Fox. That gentleman met the Mayor and Town Clerk on Tuesday; and he would probably be before them again in the course of a few days. What they proposed was that for the present the report should be withheld, and that a special meeting of the Council should be called—he himself hoped within the next week; but he could not say whether this would be so—and at that meeting they would be able to explain what had taken place with Mr. Fox or anybody else, and thus make what he believed would be a complete report to the Council. That the report was not now ready for presentation was the misfortune and not the fault of the Sub-Committee. They had done their best to fulfil the promise made by the Mayor at the last meeting. The Sub-Committee did not propose to leave the matter over until the next monthly meeting of the Council.

Alderman LONGBOTTOM said he was exceedingly astonished that the report was not yet ready. It was a year since the Sub-Committee were appointed, and more than six months since the Mayor said he knew something and "could a tale unfold" respecting the contracts; and the public now wanted to know what the Mayor knew so long ago.

The MAYOR said that, if Alderman Longbottom did not intend to propose an amendment, he was out of order in making remarks on the subject.

Alderman LONGBOTTOM said he would conclude with a motion. It was now more than six months since it was stated by one member of the Sub-Committee that of his own knowledge and from what he had found out of this business, he could say that it had been a gross piece of swindling and robbery, and that he was going to expose it all.

The MAYOR: Is that your motion? Excuse me, I must have a motion. I have been tricked once before, and I will not be tricked again.

Alderman LONGBOTTOM said he would move that the Council very much regretted that the motion passed at the last meeting respecting the gas scandal—namely, that the report should be presented at this meeting—had not been complied with. He did so, he said, because he felt strongly that the Council were being somewhat befooled. The Sub-Committee, notwithstanding the time that had elapsed since the matter was put into their hands, were now going on a fishing expedition to see whether there were any charges or not. The Council ought to have had the report now; but the matter had again been shelved.

Mr. CLEGG said he was at a loss to know what Alderman Longbottom's motion was.

The TOWN CLERK (Mr. K. Walton): I must say that this is a motion which cannot be put at this meeting at this time. "To receive a report from the Gas Scandal Sub-Committee"—there is none; therefore, how can you pass any resolution thereon?

Alderman RAMSDEN contended that the Sub-Committee were asking nothing unreasonable in desiring the matter to be adjourned for a short time; and he urged that it was unnecessary to stigmatize the members of that body at the present time. He ventured to think that the Council would not deny the Sub-Committee's request. The Sub-Committee were prepared to give the report in a short time; but in their judgment it was better to wait.

Alderman RILEY said he was quite willing that the question should be fought out, and that the Sub-Committee should get all the information possible before submitting their report. He wanted the matter to be thoroughly sifted; and if the Council had voted, he would have voted in favour of the Sub-Committee being allowed an extension of time.

The MAYOR said that the sole object which the Sub-Committee had in view was to give the report in its entirety. The reason why they wished to have the extension of time asked for was stated that afternoon to Alderman Longbottom, to whom the explanation seemed quite satisfactory. He (the Mayor) was completely astonished at the way in which Alderman Longbottom had abused him at that meeting. He did not deserve such treatment. He had striven to act faithfully and truly towards the Corporation; and he thought that time would prove him to have been worthy of the position that he now held.

The subject was then allowed to drop.

THE WATER SUPPLY OF TUNIS.—The new water-works for the supply of the city of Tunis have just been opened. They consist partly of new reservoirs, and partly of the old aqueduct supplying the city of Carthage with water, which has been restored for a distance of twelve geographical miles.

THE WORKS OF THE EAST LONDON WATER COMPANY.

On the occasion of the recent visit of the Society of Engineers to the works of the East London Water Company at Lea Bridge, Walthamstow, and Waltham Abbey, noticed in the JOURNAL last week, a short printed description of the works and plant, prepared by the Company's Engineer (Mr. W. B. Bryan, M. Inst. C.E.), was presented to the visitors. The following particulars extracted therefrom may be of interest to our readers:—

East London was first supplied with water by the Shadwell Water-Works Company, who commenced operations in 1669. In 1747 the West Ham Water-Works Company was incorporated for supplying Stratford, West Ham, Bow, &c., with water. In 1808 a new Company was established to purchase or amalgamate the Shadwell and West Ham Water-Works, under the title of the East London Water-Works Company. The Company constructed at Old Ford certain reservoirs, and erected a pair of engines called the "Twins." These were built by Messrs. Boulton and Watt; and after 80 years' service are still in first-class order, and work with fair economy. By virtue of the powers conferred by successive Acts of Parliament, the intakes of the Company have been carried higher up the Lea. The intakes are now at Ponder's End; the actual works commencing at Chingford Mill. The water passes through open and covered channels to the eight reservoirs at Walthamstow. These reservoirs cover an area of 236 acres, and have an available capacity of 610 million gallons. The water from the River Lea is passed through these reservoirs, and then along a broad open channel to the filter-beds at Lea Bridge. After filtration, the water flows to the various engine wells at the Lea Bridge and Old Ford pumping-stations, whence it is pumped into the Company's district. In addition to the supply from the Lea, the Company have sunk several wells into the chalk. The auxiliary supply from the Thames is taken from the river about a quarter of a mile above Sunbury Lock, from which point it is pumped to Hanworth. There are six filter-beds at this station; and three powerful engines drive the filtered water through about 19 miles of main into a reservoir situate in Finsbury Park, whence it gravitates all over the Company's district. The Company supply about 1,235,000 inhabitants with water; and, in addition, the docks on the north side of the Thames, as well as numerous manufacturing premises in the East-end of London and also at West Ham and in the county of Essex.

The following is a description of the various engines at the different pumping-stations:—

Old Ford.—The "Twins:" Each engine has a cylinder 36 inches in diameter and 8-feet stroke. They are of the single-acting rotary type, and were built, as already stated, by Messrs. Boulton and Watt. The initial pressure of steam in the cylinders is about 8 lbs. per square inch. Their use has been discontinued the last four years, except for emptying the reservoir. Prior to 1885 they had been in continuous use since the year 1807. The "Cornish:" This engine was the first Cornish engine ever erected for water-works purposes, and effected an enormous economy in the distribution of water. The cylinder is 80 inches diameter, with 11-feet stroke. The diameter of the pump is 41 inches; its capacity, 1,500,000 cubic feet per day. The "Wicksteed:" This engine has a cylinder 90 inches in diameter, with 11-feet stroke. The diameter of the pump is 44 inches; its capacity, 1,700,000 cubic feet per day. The "Hercules:" This engine has a cylinder 86 inches in diameter, with 10-feet stroke. The diameter of the pump is 43¾ inches; its capacity, 1,600,000 cubic feet per day. The "Ajax:" This engine has a cylinder 72 inches in diameter, with 10-feet stroke. The diameter of the pump is 36 inches; its capacity, 1,400,000 cubic feet per day. These engines are all of the Cornish type, and work with a boiler pressure of 40 lbs.; but with an initial pressure on the engines of about 20 lbs. They all work with remarkable economy, although they have been in use from 32 to 51 years. The "Cornish" was built in 1838, and is in as good working condition now as when erected; and it does in regular work 80 millions of duty—equal to an effective horse power with about 2¾ lbs. of coal. All the coal taken into the stoke-hole is reckoned; no deductions being made for ashes, or for any other purposes. In addition to the above-named engines, there is a small high-pressure condensing engine, used to pump from a well sunk into the chalk. The pump is 15 inches in diameter, and is about 140 feet from the surface.

Lea Bridge.—The "Victoria:" This engine was erected in 1854. The diameter of the cylinder is 100 inches; the stroke, 11 feet. The diameter of the pump is 50 inches; its capacity, 2,160,000 cubic feet per day. The "Prince:" This has a cylinder 84 inches in diameter, with an 11-feet stroke. The diameter of the pump is 45 inches; its capacity, 1,728,000 cubic feet per day. The "Princess" engine is an exact duplicate of the "Prince." The "Duke" is a compound rotary engine, with a high-pressure cylinder 23 inches in diameter, and a low-pressure cylinder 39 inches in diameter; the strokes being respectively 4 ft. 5 in. and 6ft. 6 in. The pumps are of the bucket-and-plunger type; the bucket diameter being 22 inches. Their capacity is 414,720 cubic feet per day. The "Duchess" engine is exactly similar to the "Duke." The "Horizontal" is a compound engine, with cylinders 23 and 40 inches in diameter; the stroke being 3 feet. The diameter of the pump is 22 inches; its capacity, 552,960 cubic feet per day. At the "Duke" and "Duchess" engines a new well has been sunk into the chalk. Exceptional difficulties were encountered in sinking the cylinders; from the surface of the ground to the chalk being entirely quicksand. The well has been sunk to a total depth of 204 feet. The pumping-engine has cylinders 24 and 44 inches in diameter, with 6-feet stroke. The two pumps are each 22 inches in diameter; they were built by Messrs. Hathorn, Davey, and Co., of Leeds. Tunnels are being driven in the chalk from the bottom of the well, for the purpose of collecting as large a volume of water as possible. In addition to the steam-engines, there are two powerful "Hercules" turbines, each 45 inches in diameter, built by the Holyoke Machine Company, of Massachusetts; also two water-wheels. The maximum power of the wheels and turbines is about 140-horse power, with an available fall of 6 ft. 6 in.

With regard to the pumping, filtration, and storeage arrangements, the Company have at their Walthamstow station eight reservoirs, with a total capacity of 910 million gallons, and an available capacity, as already stated, of 610 millions. A large well, 15 feet in diameter, is in course of construction. At the present time a smaller well is in operation; the water being pumped from this by means of a high-speed "Hercules" turbine, the power from which is conveyed to the pumps by means of a steel rope. The total lift of the pumps is 200 feet. Messrs. Hathorn, Davey, and Co., of Leeds, have supplied a compound horizontal Cornish deep-well pumping-engine, which is a duplicate of that at the Lea Bridge well. At the Chingford station there is a well and bore-hole of a total depth of 450 feet. The water is lifted by means of two "Girard" turbines; the available fall being about 7 ft. 9 in. The total lift on these pumps is about 350 feet. The water is raised to Woodford, where there are two covered reservoirs, each of a capacity of 1½ million gallons. The water is pumped into these reservoirs by the "Duke" and "Duchess" engines at Lea Bridge. There are a pair of horizontal high-pressure condensing engines; and they lift the water as far as the High Beech reservoir for the purpose of supplying the high-level districts, such as Loughton, Buckhurst Hill, Woodford, Chigwell, and the neighbourhood. At the Waltham Abbey pumping-station a well has been sunk into the chalk, and powerful triple-expansion engines have been erected for lifting the water to the surface and then forcing it to the High Beech reservoir. The total lift of water at this station will be 550 feet. The engines were built by Messrs. T. Richardson and Sons, of Hartlepool. The cylinders are 18, 30½, and 51 inches in diameter respectively; and all have a stroke of 3 feet. The boilers were made by Messrs. Babcock and Wilcox; and the working pressure is 150 lbs. per square inch. At High Beech a new reservoir has been constructed to hold 2½ million gallons. The top-water level is 371 feet above Ordnance datum. This reservoir can be filled either from Woodford or from Waltham Abbey. The Hornsey Wood reservoir is situate in Finsbury Park. It contains 5 million gallons, and is connected with the Lea Bridge as well as with the Thames works. Its altitude is 142 feet above Ordnance datum. The filter-beds are 25 in number, covering about 25 acres.

As previously stated, the Company have an auxiliary supply from the River Thames. The intake is at Sunbury, where there are two "Bull" engines, each capable of lifting 1,600,000 cubic feet of water a day to Hanworth, to be filtered, and then pumped to London. At Hanworth, there is an open reservoir of 5 million gallons capacity. There are six filter-beds with an aggregate area of about five acres. The filtered water is pumped by means of three large Cornish engines; the cylinders being 84 inches in diameter, with 9-feet stroke. The maximum load on these pumps, when the full quantity of water is being raised, is about 240 feet. The length of the main from Hanworth to the Hornsey Wood reservoir is 19 miles, and its diameter 36 inches. The joint capacity of the three engines is 23,283,000 cubic feet per day. At Hanworth several wells have been sunk. These are connected by tunnels; and a considerable volume of water is pumped daily by means of two small compound centrifugal engines built by Messrs. J. and H. Gwynne, of Cannon Street. The water is lifted into two covered reservoirs, and mixes with the filtered water from the beds before being pumped to London.

THE EDINBURGH AND DISTRICT WATER TRUST AND THE DETECTION OF WASTE.

THE ENGINEERS' REPORT.

At the last Meeting of the Edinburgh and District Water Trust, an exhaustive report on the experiments which the Engineers (Messrs. Leslie and Reid) have been conducting with a view to testing the value of the waste-water meter system for detecting leakage and misuse of water was presented.

The report stated that four months had been occupied in the experiments; and four districts had been operated upon by an inspector provided by the Deacon Waste-Water Meter Company and by one of the Engineer's assistants. The districts were Glenogle, Stockbridge, Buckingham Terrace, and Merchiston. The Glenogle District has a population of 1763; and it consists entirely of workmen's houses. The meter was placed there on Jan. 24; and after allowing the usual time to elapse before commencing the day inspection, the regular night work in this district was begun on Feb. 4. The consumption before commencing operations was found to be at the rate of 37,120 gallons per day—equal to 21·66 gallons per head; while the discharge during the night—say from 11 o'clock till 5 o'clock in the morning—was at the rate of 1200 gallons per hour, the most of which was, doubtless, due to waste owing to defective apparatus. The operations in this district were continued for 89 days, during which time six night inspections were made for the purpose of ascertaining the existence and position of the faulty apparatus causing waste at night, and these were followed up by regular inspection of the fittings in the houses suspected, with the result that the total consumption per day fell on March 13 to 25,000 gallons, or 14·18 gallons per head per day of the population, while the night flow, above referred to, fell to the rate of 300 gallons per hour. But on May 24, after the inspections had been discontinued for six weeks, the total daily consumption was found to be 34,170 gallons, or 19·32 gallons per head; while the nightly flow was at the rate of 390 gallons per hour. The Stockbridge district has a population of 3218, and consists partly of better-class houses, along with a large proportion of lower-class properties. The meter was placed here on Jan. 17, and near it was fixed a Siemens meter for the purpose of checking the observations made as to the rate of consumption, as indicated by the Deacon meter. The night work in this district was commenced on Feb. 13, when the consumption was found to be at the rate of 66,800 gallons per day, equal to 20·76 gallons per head; while the discharge during the night was found to be at the rate of 2100 gallons per hour. The operations in this district were continued for 68 days, with the result that the total consumption fell on April 12 to 52,640 gallons, or 16·35 gallons per head per day of the population; while the night flow, above referred to, fell to the rate of 750 gallons per hour. On May 24, after the inspections had been discontinued for four weeks, the daily consumption was found to have reached 76,040 gallons, or 23·63 gallons per head, while the nightly flow was at the rate of 1800 gallons per hour. The chief cause of waste here was insufficient ball-cocks, stiff handles, and leaky valves to water closets; while one or two burst lead service-pipes were also discovered. The Buckingham Terrace district has a population of 1294, and consists entirely of first-class houses. A meter was placed here on Feb. 27; and the regular night inspections were commenced on March 7. The consumption was found to be at the rate of 56,300 gallons per day, equal to 43·48 gallons per head; while the discharge during the night was at the rate of 1060 gallons per hour. The operations in this district were continued for 17 days, with the result that the total consumption per day fell to 41,200 gallons, or 31·84 gallons per head per day of the population; while the night flow fell to the rate of 570 gallons per hour. On May 24 the daily consumption was found to be 39,180 gallons, or 30·28 gallons per head, while the night flow was at the rate of 240 gallons per hour. This reduced consumption the Engineers say is due to the fact that 29 houses in the district were shut up during the summer. The Merchiston district has a population of 1466, and consists almost entirely of villas. A meter was placed there on March 1, and the night inspections commenced on March 13. The consumption was found to be at the rate of 61,300 gallons per day, equal to 41·81 gallons per head; and the night discharge was at the rate of 1200 gallons per hour. The observations were continued for 22 days, with the result that the total consumption per day fell, on April 4, to 42,170 gallons, equal to 28·77 gallons per head; while the night flow fell to the rate of 500 gallons per hour. On May 24 the daily consumption was found to be 49,680 gallons, or 33·88 gallons per head; while the nightly flow was at the rate of 500 gallons per hour. Regarding the probable annual cost of applying the Deacon meter principle to the whole district of supply, the Engineers believe that this would amount to not less than £3500, against which has to be set off the present annual charge for inspection on the ordinary system, which amounts to about £400. The outlay for meters would be £7200, and 10 per cent. is taken as the annual charge thereafter. They point out that in the four districts under observation there is little or no water consumed for trade purposes; so that the savings effected have

been on purely domestic consumption. The observations also show that constant supervision and repairs are necessary to keep the apparatus up to a proper condition. This is proved by the fact that in one district, after the consumption had been reduced 33 per cent., it fell back to the former figure in six weeks after the supervision had been discontinued; while in another district the saving fell back from 31 per cent. to 19 per cent. in two weeks. They think, however, that it may fairly be assumed that the apparatus will fall back to its old state at the end of three months, when the inspections and repairs are understood to require repetition, so that the saving effected on the average may be estimated at one-half of the saving shown immediately after inspection, or say one-sixth of the average domestic consumption. In Messrs. Leslie and Reid's report of February last, the present average domestic consumption was estimated at about 30 gallons per head per day; and a saving of one-sixth would bring it down to 25 gallons per head. The quantity used for trade and sanitary purposes they reckon at 11 gallons per head, so that the total supply for all purposes under the improved system of checking waste may be taken at 36 gallons per head per day. The supply now used for domestic purposes is estimated at about 11 million gallons per day; and the saving—say, 16 per cent.—would represent a reduction of about 1,800,000 gallons per day, or 36 gallons per head, for all purposes, to a population of 50,000. Allowing for the same rate of increase in the future as has obtained in the past, the population will have increased by at least 50,000 in six years from this date, so that the water saved by the more thorough prevention of waste will be all utilized by the natural growth of the population by six years from this date. Therefore, say the Engineers, it is evident that even with the adoption of this system of waste prevention all over the area of supply, the requirements will be greater than the means of supply at the command of the Trustees before a new water scheme can be carried through; and if a very dry period, such as that of 1868–70, were to occur, the Trustees would not be able to maintain constant service over the whole district. They therefore see no reason to alter the opinion given in their report of February last—viz., "We have no doubt that by a system of careful night inspection, such as that advocated by the Deacon Waste-Water Meter Company, and which is now being tried in two districts in this city, a certain reduction in the consumption might be effected; but seeing that a considerable time—probably seven or eight years—must elapse before any new supply can be made available, it would not, in our opinion, be prudent for the Trustees to delay much longer in maturing a scheme for obtaining an additional supply." Messrs. Leslie and Reid are of opinion that the Deacon system has a great deal to be said for it; and it might with advantage be adopted over the whole area of supply, if the saving of water that is likely to be effected be sufficient to justify the expense. The yearly charge for waste prevention by this system, including interest on first cost and upkeep of meters, they place at £3500 a year, for an estimated saving of 1,800,000 gallons per day; but, they observe, it must be remembered that there will be an increased expense put upon house proprietors in keeping their apparatus in the state of perfection necessary to secure this estimated saving of water. If the Trustees do not adopt the system in its entirety, they think it will be necessary for them to adopt the principle of night inspection with or without meters, so as to keep the consumption within reasonable limits, and thus enable the Trustees with their present supplies to meet the requirements of a growing population, and a constantly-increasing demand for trade and sanitary purposes.

The Works Committee recommend that the Trust approve generally of the report; and, considering that no waste had been found to exist from defective mains, with one exception, which was what was known as a "blown joint" on a 3-inch pipe, it was apparent that the chief cause of waste as disclosed by the report, was through defective house apparatus, and that the Trustees, before proposing to extend the use of meters, should re-organize the present staff of inspectors, so as to provide for proper night inspection.

Bailie Walcot asked whether the Committee was satisfied that the experiments had been sufficiently extensive, or long enough; or whether they could be taken for what would likely be found in other parts of the city. The districts selected were newer than other parts of the city; and it might be expected that the fittings would be much better.

Bailie Archibald moved that the Committee's recommendation be approved, and that the matter be sent to the Works Committee to be carried out. It would be remembered that, when it occurred to the Trustees last year that a new supply of water was likely to be required soon, they visited the Manor Valley, and afterwards the Engineers made what was termed an interim report. After that the Deacon Meter Company, having apparently heard of their position, came forward with the offer of their Deacon meter. The wonders of this meter were said to be very great. The Manager of the Company (Mr. Hope) told him that it was his impression that they were wasting about one-half of their total supply. This appeared to him to be a very extraordinary statement. He asked Mr. Hope if the waste would be found in defective house apparatus, and was told it would not, but that it would be in defective mains and service-pipes, and that about seven or eight million gallons per day were running to waste into the drains. This was to be saved for the modest sum of £10,000. Directing attention to the actual facts in the four districts reported upon, he demurred in the first place to any statement that the flow of water in the pipes between 11 p.m. and 5 a.m. was due to waste. Would anybody believe that no water was drawn in those hours? They found that in the Glenogle district the nightly flow was reduced on May 24 to 390 gallons per hour; but on March 13 it was 300 gallons per hour, so that, while there was an increase in the nightly flow of 90 gallons per hour, the consumption increased 5 gallons. This observation applied to the whole of the districts. He accounted for the rise in the consumption by the fact that March was a cold month; and May was a warm one. In the Stockbridge district, whereas the night flow had been reduced to 450 gallons per hour, it had risen, on May 24, to 1800 gallons per hour. It was true there was a large quantity of faulty apparatus in that district. The Deacon meter system he considered too expensive for remedying this. What he thought they should do was to take power, wherever they found defective fittings, to remove them, and replace them with proper ones. In the Buckingham Terrace district the night flow was brought down from 1060 to 570 gallons per hour; but then, on May 24, two or three weeks after the inspection ceased, it was down to 240 gallons per hour. In the Murchiston district the night flow was reduced from 800 to 500 gallons per hour; and although the consumption rose between April 4 and May 24 from 28·77 to 33·88 gallons per head per day, the warm weather was probably the cause, because the night flow remained the same. Taking the four districts, and not adopting the lowest readings, he found on May 24 a consumption of nearly 27 gallons per head. They had a demand of about 11 gallons per head for sanitary and other purposes; and this made the consumption about 38 gallons per head for all purposes. It would cost about £3500 per annum to work the Deacon meter; and to introduce the system would cost £7200. If it were necessary to reduce the supply to 36 or 35 gallons for all purposes, he believed that they would be bound to do it; but in consideration that their works could furnish 41 gallons, he did not think it would be prudent to do so. What he recommended was that they should extend their inspecting staff, and have night as well as day inspectors. They might put a few meters in as well as increasing the staff, to be a check upon the inspectors. Mr. Coyne, their present Surveyor, was overburdened, and had not premises sufficient for an increased staff; and so he (Bailie Archibald) proposed that they should form a separate branch for the detection of waste, with an overseer. They had asked the Engineers for their opinion as to a new supply; but he did not think they should be guided entirely by their Engineers. They should take the responsibility themselves; and his opinion was that, seeing it would take seven or eight years to bring in a new supply, they should keep the question before them.

Sir J. Gowans, in seconding the motion, said it was known that the bulk of the houses in the Stockbridge district were fitted with appliances very much inferior to those at present in use; and no Deacon or Siemens meter could meet that. There must always be a large percentage of waste which was not preventable. They could not delay any longer in looking out for a new supply. He believed the Deacon meter was very serviceable in towns where the mains were not so well laid as they were in Edinburgh.

Mr. Wood supported the recommendation of the Committee. The practice of the Deacon Meter Company, he said, was to concentrate pressure in small districts; and therefore, unless the apparatus were of the strongest, they would give way. The Deacon Company interfered very much indeed with the supply of water. The water office was inundated with complaints from residents that they had been left without water for days together. They must take this into account, because it would bring about a reduction of the consumption.

The Lord Provost asked if it was not the case that one of their own men went along with the Company's men.

Mr. Coyne said the man from his establishment was a pipe-layer, who had no experience in checking waste.

Bailie Archibald said there was no desire to throw blame upon the Deacon meter men, but only to show that there was carelessness in the working.

The report was then approved; and it was remitted to the Works Committee to carry out their recommendation.

Reports on the Experiments by the Deacon Waste-Water Meter Company.

Two reports have been prepared by the Deacon Waste-Water Meter Company on the experiments, and forwarded to the Water Trust. In the first one (which is dated April 30) they state that they consider the results achieved in the Glenogle district to be satisfactory; the continuous night flow having been in February 1200 gallons per hour, whereas it has lately been as low as 300 gallons per hour. In this district, among other defects, a number of ball-cocks have been found leaking under the night pressure, though tight under day pressure. They point to the difficulty of getting alterations made where no defect can be pointed out in the daytime; and it is believed that some such ball-cocks remain still unaltered. Were these improved, the night flow should, they say, be reduced to 150 gallons; this point having been actually reached when the premises in question were shut off for the time being. The Stockbridge District it is considered is rather an inconveniently large one; the population being over 3200. It has proved very fruitful in defects; a total of nearly 150 having been reported by the Company. In consequence of the repairs lately effected, the original night flow of 2100 gallons per hour sank to 750 gallons per hour. They think that their work at Stockbridge should be judged by the number of defects discovered rather than by any other standard; and it should be borne in mind that both these districts were taking at starting only half the average quantity per head supplied to the whole town—viz., 20 to 21 gallons in place of 41 gallons, so that a very large saving was not to be looked for. They considered the Stockbridge district afforded an excellent instance of the usefulness of the Deacon meter. The meter showed that it required attention three or four times as often as the other districts, and further, that the waste was principally confined to certain streets. In Buckingham Terrace district, the original night flow of 1060 gallons per hour has been so far reduced to 570; and in the Merchiston district, the original night flow of 1200 gallons had been so far reduced to 500. In conclusion, the Company ask the members of the Trust not to base any opinion of the ordinary cost of inspection upon this experimental work, as it is evident that the recent expenses do not correspond with those of the every day working of the system. In their second report (dated May 27), the Company stated that on the previous Friday night a final diagram was taken from each of the four districts. The Glenogle district showed a waste at night of 390 gallons per hour (in February it was 1200). This district had not been touched for some time; and it appeared to be holding out well. The Stockbridge district, on the contrary, had receded since the inspector left it almost to its original figure. When first taken in hand, it was wasting 2100 gallons per hour. This was at one time reduced to 750 gallons; but on the Friday night it had gone back to 1780 gallons. It is evident, they say, that only radical measures with respect to the fittings on certain parts of this district would enable it to be permanently kept in order without an excessive amount of attention. In the Merchiston district, the night flow recorded on the Friday night was 500 gallons per hour. The night flow in this district at starting was 1200 gallons per hour. In the Buckingham Terrace district, the diagram indicated a night flow of 230 gallons per hour, which compared well with the original 1060 gallons per hour. Notwithstanding their very large day use of water, the high-class Buckingham Terrace and Merchiston districts, the report says, are now taking (use and waste combined) very considerably less than the average quantity per head per day supplied to the whole town. Stockbridge and Glenogle districts, containing property of a more ordinary class, are content with a still smaller quantity. It would therefore not seem unreasonable, the Company remark, to expect that by a general use of the Deacon system, a substantial saving might be made over the whole supply.

Darwen Gas and Water Works.—Mr. J. H. Ellison, the Borough Treasurer of Darwen, has issued the yearly abstract of the Corporation accounts for the year ended March 31 last. With reference to the gas-works, the sale of gas realized £15,454. The manufacture of the gas cost £7448; and the distribution, £958—together, £8406. There was a net profit of £546, as against £1768 last year. The capital account shows that the outlay on new buildings and plant up to the above-named date amounted to £17,906; bringing the present cost up to £119,268. The balance-sheet shows liabilities amounting to £151,189, and assets to £179,638; leaving surplus assets to the amount of £28,449. The water-works revenue account shows a net loss of £412. During the year, however, £103 19s. was spent in analyzing the water; and new mains, &c., cost £404. The balance on the water-works sinking fund account was £2109.

THE WATER SUPPLY AND SEWERAGE SYSTEMS OF SWEDISH TOWNS.

In a recent number of the *Builder*, some particulars were given, from the Swedish technical journal the *Helsovan*, of Stockholm, respecting the hygienic condition of Swedish Towns; and they show a rather startling condition of things as far as water supply and sewage discharge are concerned. In Stockholm, for instance, no regular water supply was established until 1861; the water being then drawn from the adjacent Lake Mälare. The sewerage works were not commenced until seven years after, and were, in reality, as regards the central and most populous part of the town, not completed until 1884. The cost of the water-works was £300,000, and that of the sewerage works £200,000. The length of water-mains is 146,000 metres; that of the sewers, 14,000 metres. In Gothenburg, the water and sewerage works were finished in 1870; the cost of the former, though only 92,000 metres in length, being £130,000, and that of the latter, 7000 metres, £75,000. Only twenty more towns in Sweden have a regular and continuous supply of water; the fluid being in all others obtained from wells, ponds, &c. In ten of the towns thus favoured, it is furnished from an adjacent lake by natural pressure; in the remainder, pumping is necessary. In from 80 to 90 per cent. of the houses in these towns, the supply is continuous. The consumption varies from 5½ gallons at Udevalla to 40 gallons at Shöfde per individual daily; being in Stockholm 10·10 gallons. In thirteen towns water for domestic purposes is furnished by the city free of charge; but in the remaining nine it is charged for, including Stockholm—the charge varying from 1 kr. (1s. 1d.) to 3 kr. (3s. 4d.) per room in the house annually. In one town alone—Malmö—the water-rate is assessed upon the rent. The cost of maintenance and working is very heavy in Stockholm—viz., £12,000 a year; whereas in Gothenburg, with about half the population, the cost is only £2000. Turning to the question of sewerage, we encounter some startling facts, as, of the towns boasting water-works, no fewer than eight are utterly unprovided with sewers of any kind; including such important towns as Malmö, Lund, Linköping, and the two towns consuming most and least water named above. Needless to say such sanitary arrangements are also wholly absent in all smaller towns. This condition of things throughout the country causes a certain amount of anxiety; but consolation is found in the circumstance that much has been done to improve matters in recent years, and that the death-rate in provincial towns is decreasing.

Uxbridge Valley Water Supply.—The Rickmansworth and Uxbridge Valley Water Company are about to issue 3681 shares of £10 each (being the balance of their authorized share capital of £76,000), to enable them to carry out the second section of the works necessary for the supply of Hillingdon and other parishes; the first or Rickmansworth section having been completed.

Warrington Corporation Gas Supply.—At the meeting of the Warrington Town Council last Wednesday, Alderman Holmes, Chairman of the Gas Committee, stated that the Committee had accepted tenders for coal, and that the prices showed an increase of about 1s. 6d. per ton all round—involving an additional expense to the Corporation of from £1500 to £1800 for the ensuing year. As to the question of water gas, Mr. Haddock, the Gas Manager, had prepared a report, the effect of which was that he believed water gas would not come into general use as an illuminant so as to interfere with ordinary coal gas.

Reductions in Price.—The *Aberavon Corporation* have reduced the price of gas 5d. per 1000 cubic feet, as from the 25th ult.——It has been decided to make a reduction from 2s. 8½d. to 2s. 6d. in the charge for gas by the *Workington Town Council*, from the end of the current quarter.——The *Oswaldtwistle Local Board* have decided to reduce the price of gas to 2s. 8½d. per 1000 cubic feet.——The *Rochdale Corporation* decided last Thursday to reduce the price of gas for heating, cooking, and other purposes except lighting, to 2s. per 1000 cubic feet. The lowest price hitherto has been 2s. 6d.; and to ordinary small consumers 2s. 9d.

Norwich Water-Works Company.—The ordinary meeting of this Company was held last Wednesday week. The Directors' report for the half year ending March 25 (which was adopted) declared that, after payment of working expenses, debenture interest, and dividend on the preference shares, and including the balance from the previous half year, there remained a sufficient sum to pay a dividend on the ordinary shares at the rate of £5 15s. per cent. per annum (deducting income-tax), leaving the sum of £647 to be carried forward to the credit of the next accounts. The new works for supplying the Mousehold district and other parts of the city with water are being pushed forward; and the Directors hope to give a supply from them during the summer of 1890.

The Use of Dust and Refuse for Raising Steam in the Rochdale Gas-Works.—At the meeting of the Rochdale Town Council last Thursday, the Gas Committee reported that they had resolved to obtain for the boilers at the gas-works two of Perret's furnaces for burning dust under the steam-boilers. Alderman Petrie explained that the furnaces referred to were made for burning dust and refuse ashes which at present and hitherto had to be carted away at a certain cost per ton. At the Rochdale works it was estimated that they sent away about 1500 tons of refuse every year. On analyzing and testing it they found that about 50 per cent. of the material would burn under right conditions; the other 50 per cent. being mineral matter and moisture. A Sub-Committee had viewed the furnaces at various places in Manchester, and they seemed to be working remarkably well. By their use, there would be only about half the ordinary amount of refuse to cart away, and they would obviate the consumption of 500 or 600 tons of coke per annum, which would be a saving of about £150. The Committee's resolution was confirmed.

Reduction of Meter-Rents at Coventry.—At the meeting of the Coventry City Council last Tuesday, the Gas Committee recommended the following reductions in the rates charged per quarter for the use of meters:—For 2-lights, from 1s. to 6d.; for 3-lights, from 1s. to 9d.; for 5-lights, from 1s. 3d. to 1s. The recommendation was made in the belief that the reduced charges would cause many to burn gas who are now deterred from using it owing to the meter-rent. Mr. Andrews, the Chairman of the Gas Committee, in moving the adoption of the Committee's report containing the recommendation, remarked that it was only the rates for small meters that needed to be adjusted. For a 2-light meter, for which they charged 1s. a quarter, Birmingham charged nothing at all, Leamington 9d., and Nottingham 8d. A 3-light meter, for which they charged 1s. a quarter in Coventry, was lent free in Birmingham, charged 1s. in Leamington, and 8d. in Leicester, Rugby, and Nottingham. The object of the Committee was to assimilate their charges to those of other towns in the neighbourhood. In many small shops in Coventry gas was not used; and it was not consumed in half the houses. They had 10,600 houses or thereabouts; but gas was only burnt in about 5200. The amount surrendered to consumers by the reduction would be £212 a year—a small amount compared with the surplus which had been added by the year's profit. The report was adopted.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

Edinburgh, *Saturday*.

Six applications have been lodged for Provisional Orders to give power to supply the city of Edinburgh with electric light. The question of what is to be done with them is under the consideration of the Town Council and the Gas Commission. So far as appearances go, they may keep their minds easy. Their best policy, I presume, would be to stand by, because, where there are so many applicants, there is almost certain to be so much fighting amongst themselves that interference by anyone else would but add another combatant, which would be unadvisable at the present time.

Two Companies are applying for power to supply Dundee with the electric light. The subject was discussed at the meeting of the Gas Committee on Wednesday, when Treasurer Nicoll suggested a remit to make inquiries into the subject. This was agreed to; and a Committee was appointed to prosecute the inquiry. In the course of the discussion, the Treasurer stated that six years ago a company arranged to introduce the electric light into Dundee; but the conditions under which they obtained the power were so onerous that the arrangements were never carried through. At the meeting of the Town Council on Thursday, the Clerk read notices of application for power to supply the city with the electric light, which had been received from the Anglo-American Brush Company, and the Electric Construction and Maintenance Company, of London. After a sensible speech by Mr. Low, who said they should obtain the best possible advice they could on the subject, the applications were referred to a Special Committee.

Lord Wellwood, in the Court of Session, has decided that there is a relevant case against the Edinburgh and Leith Gas Commissioners in connection with the action of Messrs. George Mackay and Co., brewers, of Edinburgh, to which I referred a week or two ago in my "Notes." His Lordship ordered issues to be adjusted for trial by jury; but before this could be done, the Commissioners re-claimed to the Inner House. The effect of this will be that both the actions by Messrs. Mackay—the one against the Edinburgh Gas Company, and the other against the Gas Commissioners—will be taken together; and thus the deadlock which was imminent a few weeks ago is removed.

A question of importance to holders of gas stock was decided in the Second Division of the Court of Session on Wednesday. Mrs. Mitchell, of Largs, by her will, dated Aug. 2, 1884, directed her trustees to transfer to her niece Ann Jane Barbour, now the wife of William Fergus, of Glasgow, the "shares standing in my name in the Paisley Gas Company." At that time, however, there was no Paisley Gas Company in existence, because the Corporation had previously taken over the gas-works and converted the shares into annuities. Matters were still further complicated by the fact that between the date of Mrs. Mitchell's will and her death in 1885, the Corporation had resolved to redeem the whole of the gas annuities; and in these circumstances Mrs. Mitchell's Trustees and Mrs. Fergus concurred in asking the Court to decide whether the provision in the will above quoted was sufficient to justify the trustees in assigning to Mrs. Fergus the mortgage for £320. The Court—Lord Rutherford Clark dissenting—held that it was, and answered the question accordingly. In their opinion, Mrs. Mitchell's intention was to leave to her niece the amount of money originally invested in gas shares.

Mr. Adam Pratt, who was returned to the Aberdeen Town Council on account of the part he took in agitating against alleged overcharges for gas, obtained, at the Council meeting on Monday, a remit to a Committee to consider whether they should determine to have all their gas-meters tested—the wet every fourth, and the dry every third year. In support of his proposal, Mr. Pratt stated that his own gas account had been reduced by £8 6s. 10d. for the half year, and that he had information from others that theirs had also been less. The only argument against him, he said, would be the cost of testing 20,000 meters; but this, he considered, should have no bearing on the case, because they ought to have a just measurement.

The Gas Commissioners of Dunbar have been going very fully into the matter of coal analysis. It will be remembered that at their meeting last month they left the subject of their coal contracts over till the Gas Manager (Mr. Cuthbert) should report on the quality of three of the varieties offered—Dryden, Boghead, and Arniston. Mr. Cuthbert has reported to the following effect:—Boghead (Rosewell) analysis, 13,250 cubic feet per ton; actual, 9120 feet of 32-candle power—showing a deficiency of 4130 feet per ton. Arniston analysis, 12,570 feet; actual, 11,720 feet of 32·37-candle power—deficiency, 850 feet per ton. Dryden, actual, 10,400 feet of 30-candle power. 600 tons of Boghead yield 5,472,000 cubic feet—deduct 20 per cent., 1,094,000 feet, and this leaves 4,377,600 feet, at 5s. 10d., £1276 15s. 6d. 600 tons of Arniston, at 20s. per ton, yield, 5,625,600 cubic feet. 600 tons of Boghead, at 19s. 5d., yield 4,377,600 feet. Arniston produces over and above Boghead 1,248,000 feet; and, deducting 7d. per ton from 600 tons of Arniston coal (£17 10s.), 60,000 cubic feet, or a clear profit of £346 10s., appeared according to the test. Treasurer Anderson said the cost per ton was: Dryden, 18s.; Arniston, 20s.; and Boghead, 19s. 5d. He took the yield of 600 tons of Arniston, and, after deducting 20 per cent., found the value of gas to be £1625. Dryden in the same way was worth £1456; Boghead, £1276; and, on comparing Arniston with Boghead, found the former to exceed the latter in the production of gas by 1,188,000 cubic feet, or, in money value, £346 10s. Mr. Smith moved that the Gas Manager's recommendation be adopted; and this was seconded by Bailie Christie, and agreed to.

The results of the first year's working of the sulphate plant at the Inverness Gas-Works are very satisfactory. Mr. J. Thomson, Gas Manager, reported to a Committee of the Police Commissioners, on Wednesday night, that the income from sulphate of ammonia, tar, and naphtha, amounted to £1113; and the expenditure, including interest on capital and depreciation, to £410—leaving a profit of £703. The amount which they would have received from a contractor would have been £208; so that the Commissioners, by working up the products themselves, had a clear gain of £495, or only £5 less than the cost of erecting the whole sulphate plant. The Provost (Sir Henry MacAndrew) congratulated the Commissioners on the great success of the new sulphate-works. Looking to the handsome revenue derived, and the extra responsibility placed upon the Manager in connection with these works, as well as to the fact that Mr. Thomson had succeeded in fitting up machinery of a very suitable kind without infringing any existing patent, he thought he was fairly entitled to the consideration of the Commissioners in the matter of an increase of salary. The subject will come before the Police Commissioners at their first meeting.

The following dividends have been announced this week:—Duns Gas Company, 8 per cent.; Nairn Gas Company, 7½ per cent.; Alyth Gas Company, 6 per cent. (capital to be increased from £2500 to £3000); Banff Gas Company, 6 per cent., with 2s. per share bonus, equal to a return of £1 per share; Markinch Gas Company, 10 per cent.; Brechin Gas Company, £1 15s. per share (minimum charge for meters reduced from 2s. to 1s. 6d. a year); and Crieff Gas Company, 5 per cent., with a bonus

of 1s. per share, which is equal to an additional 5 per cent. (price reduced from 5s. to 4s. 7d. per 1000 cubic feet).

The domestic water-rate in Dundee was on Thursday reduced by the Water Commissioners from 1s. 2d. to 1s. 1d. per £1, in accordance with the estimates given in my "Notes" last week.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday*.

Supplementary to my opening "Note" of last week, I may mention that, at a meeting of the Committee of the North British Association of Gas Managers in Glasgow this week, the list of papers to be read at the annual meeting of the Association at Dunfermline on the 25th inst. was completed. Mr. Macpherson's paper is entitled "A Retort-Setting for Small Gas-Works;" and that by Mr. Bell, of Peebles, bears the title "Presence of Sulphur Compounds in Mineral Illuminating Oils." Mr. J. Hall, of St. Andrews, a former President of the Association, is set down for a paper entitled "Notes on Purifiers." It is a very strange circumstance that, in a list of no more than six papers, two of them should have as authors father and son—one of the papers, as I mentioned last week, being by Mr. T. D. Hall, of Montrose, to whose father I have just referred.

Of the small gas-supply undertakings in the Glasgow district, one of the most successful is certainly that of the Bothwell and Uddingston Gas Company. Their share capital is only £9000; and yet during the past year (ending April 30) there was a gross profit of nearly £1400. After writing off for depreciation, &c., and adding in the sum carried forward last year, there is a total of £2013 15s. 3d. available for division. Out of this sum it is proposed to pay a dividend of 10 per cent., absorbing £900; adding £300 to the reserve fund (already amounting to nearly £2200); and carrying forward to next year's account the sum of £813 15s. 3d. The price of gas was reduced last year from 4s. 2d. to 4s. per 1000 cubic feet, and in the preceding year from 4s. 4d. to 4s. 2d.; and it is just possible that at the forthcoming annual general meeting of the shareholders the figure may be still further lowered—to the extent of another 2d., or even 3d. Considering the fact that gas is selling in Glasgow and the suburbs at 2s. 8d. per 1000 cubic feet, 4s. at Bothwell and Uddingston, which are in a great measure residential suburbs of the city, seems rather high. But to their credit it should be said that all the public lamps are lighted and upheld by the Company. I do not know how many there are now, but about three years ago there were upwards of 200. Another creditable fact is that the Manager (Mr. Laurence Hislop) has reduced the loss of gas by leakage to about 6·5 per cent., as compared with 10, 12, 15, and 20 per cent. in many other places. The quantity of gas sold during the past year was 17,782,000 cubic feet; being an increase over that of the previous year to the extent of 786,600 feet. Including the quantities consumed in the public lamps and at the gas-works, the total consumption was 18,512,909 cubic feet, as against 17,726,300 feet in the preceding year. The reason urged by the Directors for adding so large a sum as £300 to the reserve fund this year is the alleged uncertainties and contingencies connected with the manufacture of gas; the manufacture of fittings for water-gas plant being carried on at Uddingston, within a gunshot of the gas-works, by Mr. Samson Fox's Company. The property and assets of the Bothwell and Uddingston Gas Company at the close of the past financial year stood at £13,544 10s. 1d., which is also the amount of the capital and liabilities of the Company.

The annual general meeting of the Hawick Gas Company was held last Friday—Mr. T. Laidlaw in the chair. The balance-sheet which accompanied the Directors' report showed that the year's income amounted to £7316; the principal item being £6275 for gas sold. The various items on the expenditure side of the account (including £3149 for coals) made up a total of £6039; leaving a balance of profit of £1277. The assets stood at £29,901 on the 26th of May last; the chief item being the value of the works (less depreciation), stated at £25,653. Under the head of liabilities, there is the share capital, £15,750, made up with premiums to £20,258; various other items bringing up the total to £29,901. During the past year the mains were greatly extended, and the works generally maintained in a state of thorough efficiency. The Directors recommended that the price of gas for the current year should be 3s. 2½d. per 1000 cubic feet; having been 3s. 1½d. last year, 3s. 4d. in 1887, and 3s. 6½d. in 1886. In moving the adoption of the report, the Chairman made special reference to the new water gas companies, which, in his opinion, were mere bubbles which would soon burst. A short time ago he was in Leeds; and he found that, in so far as lighting purposes were concerned, water gas was a gigantic failure. It might serve for forge purposes; but it was of no use for illuminating. The motion was seconded by Mr. R. Noble, and unanimously agreed to.

The fifty-fifth annual general meeting of the Galashiels Gas Company was held last Tuesday—ex-Provost Hall, Chairman of the Company, presiding. The accounts for the year ending May 31 last showed that the profit was £2368; and that the balance from last year's account was £522—making a total of £7592. The Directors in their report recommended that the dividend should be at the rate of 10 per cent., free of income-tax, which would absorb £2100, and that the balance of £5492 should be carried forward. The amount of gas manufactured during the year 1888-9 was 56,078,300 cubic feet; and the quantity that passed through the consumers' meters in the year was 53,192,452 cubic feet, as compared with 50,551,466 cubic feet in the year 1887-8—being an increase of 2,640,986 cubic feet. It had been agreed by the Directors to continue the price of gas for the year 1889-90 at 2s. 11d. per 1000 cubic feet, as against 3s. 2d. in 1886-7 and 1887-8. In the profit and loss account it was shown that the income amounted to £9093, of which £7684 was for sales of gas to consumers, burgh lamps, &c. The total expenditure over the year, including depreciation on the value of works, was £6725; thus showing the profit for the year to be £2368, as stated above. The report was adopted.

At the meeting of the Ayr Gas Company on Wednesday, it was reported by the Directors that the average illuminating power of the gas supplied during the past year was 26·6 candles; and that there had been an increase in the sale of gas, which had enabled the Directors to reduce the price from 4s. 7d. to 4s. 2d. per 1000 cubic feet as from February 1 last, and also to propose an increase in the dividend to the shareholders—the rate to be 6 per cent. The report was unanimously adopted.

At the annual meeting of the Saltcoats Gaslight Company last Wednesday, the construction of the new tank and gasholder was unanimously approved of; and it was resolved that a dividend of 10 per cent. be paid out of the profits of last year. A resolution was submitted authorizing an increase of the capital (which is at present £2000, divided into 400 shares of £5 each) to £4000, divided into 800 shares of £5 each. This was unanimously agreed to; and it was also resolved to issue 400 new shares of £5 each.

At the meeting of the Motherwell Gas Company last Thursday, a dividend of 10 per cent. was declared; and it was agreed to reduce the price of gas from 3s. 7d. (which has been the price for three years) to 3s. 6d. per 1000 cubic feet, as from the 1st of June.

The price of gas at Oban has been reduced this week from 8s. 4d. to 7s. 6d. per 1000 cubic feet; but this rate compared with many other towns in Scotland is still exceptionally high.

In the minutes of the Glasgow Corporation Gas Committee submitted at the Town Council meeting last Thursday, it was stated that, on the 22nd ult., a deputation from a Committee of proprietors and tenants in Dalmuir was introduced, and explained that they were anxious to obtain a supply of gas from the Corporation. They stated that they are willing to form a limited liability company for the purpose of supplying gas to the village, provided the Corporation agree to furnish them with gas in bulk. The proposed Company would receive the gas by meter at the termination of the existing main of the Corporation at Clydebank, and would bear the cost of distributing the gas to the consumers, including the necessary piping, &c. The Committee remitted to the Sub-Committee on Works, along with the Engineer, to consider and report on the application. The minute was adopted. I do not know what the ultimate result may be; but there are some members of the Committee who are much opposed to extending the gas supply farther than Clydebank proper. At this place the price charged is, by special arrangement entered into several years ago, the same as that in Glasgow, and which is said to be attended with loss to the Gas Trust. In order to get the supply to Clydebank, the mains had to pass over a stretch of country extending to about 3 miles, within which there is scarcely any gas consumed worthy of mention.

During the year ending May 31, the amount of gas made in the three Glasgow Gas-Works was 2,905,796,000 cubic feet, as compared with 2,705,444,000 cubic feet in the year 1887-8; thus showing an increase of 200,352,000 cubic feet, or about 7·4 per cent., as compared with 4·91 per cent. in the previous year, and 6·28 per cent. in 1886-7.

On Wednesday of this week the ordinary shares of the Partick, Hillhead, and Maryhill Gas Company were sold on the Glasgow Stock Exchange at £5 2s. 6d. per share; and this price was again wanted yesterday by sellers, but without any business being done. It should here be mentioned that a mistake was made last week in speaking of preference instead of ordinary shares.

The Glasgow pig-iron market has been a degree firmer this week, owing to an improvement in the demand, more especially for home consumption. Speculation, however, has not yet responded; but this may be due somewhat to the holiday season. Scotch warrants have fluctuated in price between 43s. 6d. cash on Monday, and 43s. 10d., at which there were sellers yesterday afternoon.

In the local coal trade there is very little change to mention. In the export branch there is a certain degree of quietness, partly owing to a falling off in the orders from abroad. Furnace coal and dross are in active request.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 74.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	„	7½	Do. 7 p. c.	10	13—14	..	5 7 2
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	109—111*	+½	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	24—26	+1	7 13 10
200,000	5	15 May	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5	„	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stck.	14 Feb.	11½	Brentford Consolidated	100	229—234	..	5 0 5
125,000	„	„	8½	Do. New	100	167—172	..	5 1 9
220,000	20	14 Mar.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Mar.	11½	British	20	45—47	..	4 15 9
50,000	10	14 Mar.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
89,000	10	„	8	Do. 7 p. c.	10	13½—14½	..	5 10 4
828,750	10	30 May	10	Buenos Ayres (New) Limited	10	14½—15½	..	6 9 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	106—108*	+1	5 11 1
150,000	20	28 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	265—270	..	5 1 10
180,000	„	„	10½	Do. New do.	100	213—218	..	4 18 8
180,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125*	..	3 12 0
557,320	20	14 June	13	Continental Union, Limited	20	46—48	..	5 8 4
242,680	20	„	13	Do. New '69 & '72	14	32½—33½	..	5 8 5
200,000	20	„	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204—208	..	4 16 2
234,050	10	30 Jan.	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	„	13	Do. New.	7½	17½—18½	..	5 6 8
354,050	10	„	13	Do. do.	5	12½—13½	..	4 16 3
5,468,600	Stck.	14 Feb.	13	Gaslight & Coke, A, Ordinary	100	261—266	+3½	4 17 9
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	257—263	..	3 16 4
80,000	„	„	6	Do. F, 5 p. c. Prf.	100	128—138	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	165—170	..	4 2 9
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	255—260	..	3 16 11
1,061,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	118—121	+1	3 6 1
294,850	„	„	4½	Do. 4½ p. c. do.	100	126—130	+1½	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	171—175	+1½	3 8 6
3,600,000	Stck.	15 May	10	Imperial Continental	100	305—309	..	4 15 8
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	19½—20½	..	5 17 1
150,000	5	30 May	10	Oriental, Limited	5	9—9½	—½	5 5 3
60,000	5	28 Mar.	7	Ottoman, Limited	5	6½—6¾	..	5 3 8
166,870	10	16 Jan.	4	Pará, Limited	10	5½—6	..	6 13 4
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	106—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	99—102	+2	5 17 8
100,000	10	26 Apr.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	28 Feb.	16½	South Metropolitan, A Stock	100	317—322	..	5 0 11
1,850,000	„	„	12½	Do. B do.	100	235—240	..	5 1 0
141,500	„	„	13½	Do. C do.	100	260—270	..	4 18 1
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	136—139*	..	3 11 11
60,000	5	28 Feb.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	265—270	+1	3 10
1,720,560	Stck.	11 Apr.	7½	East London, Ordinary	100	207—211	+1	3 11 1
644,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	139—141*	+2	3 3 11
700,000	50	14 June	9	Grand Junction	50	122—126	+2	3 11 5
708,000	Stck.	14 Feb.	10½	Kent	100	272—277	..	3 15 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	253—258*	+1	3 9 9
406,200	100	„	7½	Do. 7½ p. c. max.	100	200—208*	..	3 13 10
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	119—122	..	3 5 7
500,000	100	14 Feb.	12½	New River, New Shares	100	355—360	+5	3 7 4
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk.	100	127—130	+1	3 1 6
902,800	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	172—175*	..	3 8 6
1,126,500	100	„	6	Do. 7½ p. c. do.	100	163—166*	..	3 12 3
155,086	Stck.	14 June	10	West Middlesex	100	262—267	+1½	3 14 11

*Ex div

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July 6.*

Sulphate of Ammonia.—The market has been dull during the greater part of the week, but closes somewhat steadier in tone. The quotations have been rather irregular. At Hull down to £11 15s. has been accepted; but slightly better prices have been realized at Leith and Liverpool. An unsettled state of the market may be anticipated during the next few weeks, on account of the apparent determination of "bull" operators to see values enhanced, while "bear" speculators and consumers generally are not deficient in manipulations to thwart an upward tendency. The real demand must govern the course of prices; and although there is very little inquiry from consumers at the moment, it does not necessarily follow that this will indefinitely remain to be the case. The position is almost identical with that of last year, as regards stock and production; notwithstanding which, the prices from July to September, 1888, were almost the lowest of the year, which proves that the market requires watching very closely, and that its disappointing features must not be overlooked. What influence the better tendency of nitrate will have, remains yet to be seen. Past events have shown that the two commodities do not move simultaneously in one direction; and nitrate prices can only be raised to any extent at present by artificial means. The position of the latter commodity is far too heavy; and it is now stated that there has in reality been no larger consumption this season—the excess given, and probably more, representing simply deliveries which were not consumed, but remain in dealers', &c., hands, thus rather swelling the stocks. For nitrate on spot, 8s. 7½d. and 8s. 9d. is now asked.

LONDON, *July 6.*

Tar Products.—Important business in anthracene has been reported; and this product is in a much healthier state than it has been for some time. It is now quoted higher, and is much more strongly held than it has been of late. Benzol continues sick, with no business doing; whilst carbolic acid and creosote are in good request. The efforts to "bear" pitch are proving futile—the firmness of makers and the hot weather preventing shipments having so far counteracted the depressing operations. Quoted prices are: Tar, 23s. to 28s. per ton, according to position. Benzol, 90 per cent., 2s. 8d. per gallon; 50 per cent., 2s. per gallon. Toluol, 1s. 4d. per gallon. Solvent naphtha, 1s. 2½d. per gallon. Crude naphtha (30 per cent.), 11½d. per gallon. Light oil, 3½d. per gallon. Creosote, 2¼d. per gallon. Pitch, 21s. to 23s. per ton. Carbolic acid (60's), 3s. 9d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. to £1 per ton. Anthracene (30 per cent.), "A" quality, 1s. 2d. per unit; "B" quality, 11d. per unit.

Ammonia Products.—Sulphate is selling a little more freely; but there is an absence of any competition amongst buyers. The make, however, is small; and stocks continue low. The business done has ranged between £11 12s. 6d. and £11 17s. 6d. per ton, according to position. Prices of other products are: Gas liquor (5° Twaddel), 7s. 9d. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¼d. per lb. Carbonate of ammonia, 3d. to 3½d. per lb. Muriate of ammonia, brown, £18 10s. per ton; white, £23. Sal-ammoniac, £30 to £32 per ton.

THE CARDIFF CORPORATION AND THEIR RESERVOIR CONTRACTOR.—The proceedings which were instituted some time ago by the contractor for the water-works of the Cardiff Corporation (Mr. W. Jones), in regard to certain claims he has made upon the Corporation, arising out of the breach of the contract, have been stayed, owing to the parties having come to an arrangement under which the matters in dispute may be satisfactorily settled.

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Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

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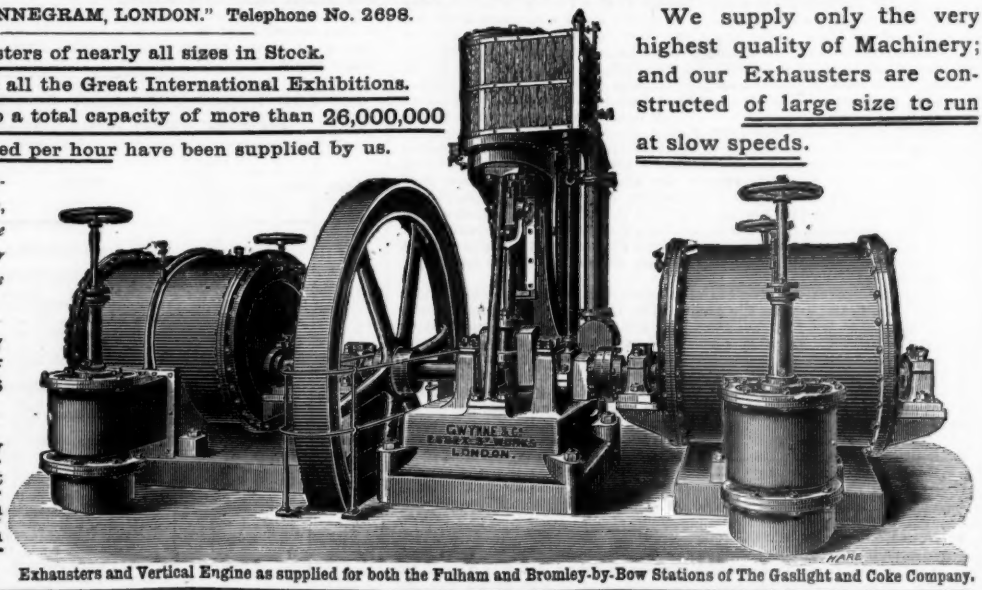

Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

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O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

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Address No. 1716, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

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*** See Advertisement p. 99 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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First-Class Award, Melbourne Exhibition, 1889, for Wet and Dry Gas-Meters, Station Meters, and Governors, Pressure-Gauges, Street Lamps, and Pillars, &c.

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ENGINEER and Draughtsman, with special knowledge of Gas and Chemical Works (has been engaged upon Works in England and abroad), desires permanent Position as ENGINEER'S ASSISTANT or DRAUGHTSMAN in large Works or Firm. Would proceed to India or Colonies under agreement. Age 33.

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JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*

Highest References and all particulars supplied on application.

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*** See large Advertisement in last week's issue, page 4.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHATE of Ammonia Lead Work and Fittings. Lead Burner. Tanks and Saturators made and repaired on the shortest notice.

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Has a practical knowledge of the Manufacture and Distribution of Gas, Retort-Setting, Main and Service Laying, &c. Age 36; total abstainer; Eleven years in present Situation. Excellent Testimonials.

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WANTED, several first-class Hands.

Apply at once to J. & H. ROBUS, 37, WALBROOK, E.C.

WANTED, a Gas-Meter Maker and Repairer; one who has been accustomed to both Wet and Dry Meters preferred. Wages, 35s. per week.

Applications to be sent, accompanied by not more than two testimonials, not later than the 12th of July, to J. TINDALL, Gas-Works, WALSALL.

THE Ascot District Gas Company require a RESIDENT MANAGER. He must have had experience in the Indoor and Outdoor Management of a Gas Company, and will be required to keep Rental Accounts, and Collect and find Sureties. Applicants to state Age, previous Engagements, and Salary expected, on or before Saturday, the 20th inst.

Address the SECRETARY, Ascot District Gas Company, Moorgate Street Chambers, MOORGATE STREET, E.C.

WANTED, a well-educated young Person as COKE CLERK in the Works Office of a Country Gas Company. One accustomed to Stores and Fittings Books preferred.

Wages to start 30s. per week, rising every two years to a Maximum of about £120 per annum.

Security to the amount of £200 in an approved Guarantee Office will be required.

Apply, by letter, to No. 1721, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DEVONPORT WATER-WORKS.

WANTED, an experienced Man as NIGHT INSPECTOR. He must have worked as a Plumber, and be able to read Meters; and, when not engaged on Night Inspection, will be required to do Plumbing Work. Constant Work. Wages, 30s. per week.

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Water-Works Offices, Devonport,
July 2, 1889.

GUILDFORD GASLIGHT AND COKE COMPANY.

WANTED, at once, by the above Company, a suitable Person as CHIEF CLERK and COLLECTOR. He must be well acquainted with the routine of Office Work, and also have some knowledge of Gas Manufacture. Age not to be under 25. Salary, £100 per annum. Security, £500. Applications, endorsed "Clerk," stating age and experience, and accompanied by two References, to be sent to Mark Smallpiece Esq., Chairman of the Gas Company, Guildford, on or before Thursday, July 11 inst. Any further particulars on application, per letter, to Mr. Longworth, Gas Offices, Guildford.

Gas Offices, Guildford, July 3, 1889.

WANTED, a good second-hand Rotary EXHAUSTER, to pass 80,000 cubic feet per hour. Lowest price and particulars to S. WHILE, 60, Queen Victoria Street, LONDON, E.C.

REDHILL GAS COMPANY.

WANTED, Two Second-hand Purifiers, 8 or 10 feet square.

Full particulars to the undersigned.

C. READ, Manager.

WANTED—Any Gas Company having for Sale one LIVESEY WASHER, and one KIRKHAM'S SCRUBBER for 500,000 feet per day, will please communicate with Mr. LONGWORTH, Gas Offices, GUILDFORD.

WANTED, Flanged or Spigot and Faucet GAS-PIPES, BENDS, TEES, and CROSSES; also three SLUICE-VALVES, all 15 inches to 18 inches diameter. New or second-hand.

Address No. 1720, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—One of Anderson's Patent ENGINES and EXHAUSTERS combined, to pass 5000 cubic feet of Gas per hour. In thorough order. Can be seen at work at the Gas-Works, Chichester, Sussex. Coming down to be replaced by one of greater capacity.

For further particulars apply to R. S. CHURCH, Secretary, Gas-Works, CHICHESTER.

FOR SALE—Freehold Manufacturing PREMISES in Birmingham; about 1700 square yards. Includes Eight-Horse Power Steam-Engine (Horizontal) and Cornish Boiler; Blacksmith's Shop and Store-Room; and enough spare Land to develop a good Business. Situate on a Bus route, and between the Stations of two Railway Companies—Five minutes' walk from either.

Address No. 1722, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF MOSSLEY.

SPENT OXIDE.

THE Gas Committee of the Borough of Mossley invite TENDERS for the purchase and removal of about 160 tons of SPENT OXIDE.

Further particulars may be obtained from Mr. R. Merrell, the Manager.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, endorsed "Spent Oxide," to be sent to me not later than Tuesday, the 16th inst.

By order,
JOSEPH HYDE, Town Clerk.

DARWEN CORPORATION GAS-WORKS.

TO TAR DISTILLERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for all the surplus TAR produced at these Works for One, Two, or Three years. The Tar will be delivered into Contractor's Tanks on the Railway.

Forms of tender and any further particulars may be obtained from T. Duxbury, Engineer, Gas-Works, Darwen.

Tenders, endorsed "Tar," to be delivered to me not later than Twelve noon, Monday, July 22, 1889,

CHAS. COSTEKER, Town Clerk.

TO CEMENT MANUFACTURERS AND MERCHANTS.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply of 50 tons of best PORTLAND CEMENT, to be delivered (carriage free) at the Bushey Station of the London and North-Western Railway.

Tenders to be sent to the Company's Offices, Bushey, on or before the 12th of July inst., endorsed "Tender for Cement," and stating the Strength guaranteed.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
WILLIAM ROWELL, Secretary.

Company's Offices, Bushey,
July 2, 1889.

BOROUGH OF ROCHDALE.

THE Gas Committee of the Corporation invite TENDERS for the supply of such quantities of BROWN OIL OF VITRIOL as they may require during the ensuing Twelve months.

The Acid to be made from Pyrites or recovered Sulphur, and to be delivered at the Rochdale Railway Station.

Further information can be obtained from Mr. T. Banbury Ball, the Manager, at the Gas-Works.

Tenders, endorsed "Vitriol," must be sent to me not later than the 16th of July inst.

By order,
ZACH. MELLOR, Town Clerk.

Town Hall, Rochdale,
July 4, 1889.

THE Corporation of Middleton are prepared to receive TENDERS for the supply of GAS COAL and CANNEL, delivered at the Middleton Railway Station (carriage paid), in such quantities and at such times as the Corporation or their Gas Manager may require.

Sealed tenders, addressed to the Chairman of the Gas Committee, to be delivered at the Office of the Town Clerk, on or before Wednesday, the 17th day of July, 1889, endorsed "Tender for Coal," or "Tender for Cannel."

Further information may be obtained by written application only to Mr. Hartley, the Gas Manager.

The Corporation do not bind themselves to accept the lowest or any tender.

FREDERICK ENTWISTLE, Town Clerk.

Town Hall, Middleton,
July 1, 1889.

THE Sutton, Southcoates, and Drypool Gas Company, Hull, invite TENDERS for the surplus TAR, also for the whole of the AMMONIACAL LIQUOR produced at their Works, at per ton over the Company's Machine, from the 1st of July, 1889, to the 30th of June, 1890, both inclusive.

Probable quantity of Tar, 600 tons.

Probable quantity of Ammoniacal Liquor, 800 tons.

Both Tar and Ammoniacal Liquor to be taken from the Company's elevated Tank into Contractor's Carts or Casks, which must be supplied as required by Vendors.

Tenders for Ammoniacal Liquor must state price per Degree Twaddell's Hydrometer, from 4° to 8°.

Further particulars may be obtained of the Manager at the Gas-Works, St. Mark's Street.

Tenders to be sent to the undersigned on or before the 29th of July, 1889, endorsed "Tender for Tar or Liquor."

DAVID WOOD, Secretary.

Offices: St. Mark's Street, Hull,
July 5, 1889.

CORPORATION OF BURNLEY.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee of the Corporation of Burnley are prepared to receive TENDERS for One, Two, or Three years, for the supply of CANNEL COAL. The quantity required will be about 2400 tons per annum; and must be delivered in such monthly quantities as the Gas Manager of the Corporation may from time to time require.

The Cannel must be of good quality, dry, and as free as possible from Sulphur, Bats, Bind, Refuse, and Dirt and must be delivered into the Waggons of the Corporation, at their Wharf on the Leeds and Liverpool Canal, adjoining the Gas-Works.

Any person or persons tendering may be required to send Samples of the Cannel offered at the quoted Prices before the Contract is let.

Tenders, sealed, specifying the description of the Cannel, and the pits at which it is to be raised, must be addressed to the Chairman of the Gas Committee, Town Clerk's Office, marked "Tender for Cannel," and posted not later than Wednesday, the 17th of July, 1889.

By order of the Committee,
WALTER SOUTHERN, Town Clerk.

C. & W. WALKER.

GASHOLDERS; PURIFIERS; PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

RETORT MOUTHPIECES; CONDENSERS;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SLIDE VALVES; TAR BURNERS; &C., &C.

WOOD SIEVES.

ADDRESSES:

8, Finsbury Circus, London, E.C.; Midland Works, Donnington, Salop.

"FORTRESS LONDON." "FORTRESS DONNINGTON,"—Telegraphic.

THE GAS INSTITUTE BENEVOLENT FUND.

NOTICE is hereby given that the ADJOURNED MEETING of the DONORS and SUBSCRIBERS to the above FUND will be held at the Westminster Palace Hotel, on Tuesday, the 16th of July inst., at Three p.m.

WILLIAM LONGWORTH, Hon. Sec.

Guildford, July 3, 1889.

BOROUGH OF BURTON-UPON-TRENT.

THE Gas Committee of the Burton-upon-Trent Corporation have FOR SALE Two TELESCOPIC GASHOLDERS, about 80 feet and 60 feet diameter respectively. They are now in use; but will shortly have to be removed to make room for Extensions.

Tenders will be received by the undersigned (from whom any further particulars may be obtained) until Saturday, the 27th inst.

The highest or any tender will not necessarily be accepted.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
July 6, 1889.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 360 tons of SPENT OXIDE, now lying at their Regent Road and Liverpool Street Works.

Forms of tender and all particulars may be obtained on application to the Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Spent Oxide," addressed to the Chairman of the Gas Committee, must be delivered at the Town Clerk's Office, before Three p.m., on the 18th inst.

By order,
SAML. BROWN, Town Clerk.

Town Hall, Salford, July 3, 1889.

WREXHAM GASLIGHT COMPANY.

TO TAR DISTILLERS, ETC.

THE Directors of the above Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works for One Year, commencing on the 1st day of August next.

Quantity produced, about 350 and 550 tons per annum respectively.

Further information may be obtained upon application to the undersigned, to whom tenders must be sent not later than the 25th inst.

The Directors do not bind themselves to accept the highest or any other tender.

By order of the Board,
THOS. WALKER,
Secretary and Manager.

Wrexham, July 5, 1889.

MANCHESTER CORPORATION GAS-WORKS.

AMMONIACAL LIQUOR.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the Purchase and Removal of the AMMONIACAL LIQUOR to be produced at the Gaythorn, Rochdale Road, and Bradford Road Gas-Works during a period of Five or Seven Years, commencing at Noon on the 30th day of June, 1890.

The Committee do not bind themselves to accept the highest or any tender.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Ammoniacal Liquor," must be delivered at the Offices of the Gas Department, Town Hall, on or before Thursday, the 8th day of August prox.

Forms of tender and further particulars may be obtained on application, in writing only, to Mr. Charles Nickson, Superintendent of the Department. A deposit of One Guinea (which will be returned on receipt of the tender) must accompany each application for a tender form.

By order of the Gas Committee,
JOSEPH HERON, Town Clerk.

Town Hall, Manchester, July 5, 1889.

VESTRY OF PADDINGTON.
(PUBLIC LIGHTING DEPARTMENT.)

TO GAS-METER MANUFACTURERS.

THE Vestry of the Parish of Paddington are prepared to receive TENDERS for the following Works, viz.:—The ANNUAL EXAMINATION and keeping in thorough REPAIR of all the METERS and cast-iron METER-BOXES attached to certain Public Lamps (about 100 in number); also the EXAMINATION, TESTING, REPAIRING, and ADJUSTING from time to time of all COCKS, GOVERNORS, and BURNERS attached to the Public Lamps (1980 or thereabouts).

The Contract to be for Five years.

Printed forms of tender may be had at the Vestry Hall, and further particulars obtained on application to the Surveyor, between the hours of Ten a.m. and Four p.m.; Saturdays, Ten a.m. and One p.m.

No tender will be accepted unless made on one of the printed forms.

The tenders to be sealed and delivered at the Vestry Hall, Harrow Road, before Three o'clock p.m. on Monday, the 15th day of July, 1889, after which no tender will be received. At the same time a £10 Bank of England Note (not to be enclosed with the tender) must be lodged with the Vestry Clerk, as evidence that the tender is made *bonâ fide*—the same to be returned immediately to Parties whose tenders are rejected; but in case of the Party whose tender is accepted, to be retained until the Contract be signed.

If the tender be withdrawn after its acceptance by the Vestry, the Deposit will become forfeited.

The Vestry do not bind themselves to accept the lowest or any tender.

By order,
FRANK DETHRIDGE, Vestry Clerk.

Vestry Hall, Harrow Road,
London, W., July 4, 1889.

ROBERT PAULSON SPICE, DECEASED.

Pursuant to the Act of Parliament 22 & 23 Vict., Cap. 35, intituled "An Act to further amend the Law of Property and to relieve Trustees."

NOTICE is hereby given that all CREDITORS and other Persons having any Claims or Demands against the ESTATE of ROBERT PAULSON SPICE, late of 21, Parliament Street, and of the Westminster Palace Hotel, both in the City of Westminster, Gas Engineer, Deceased (who died on the 11th day of May, 1889, and whose Will was proved in the Principal Registry of the Probate Division of Her Majesty's High Court of Justice on the 12th day of June, 1889, by Henry Frederick Butcher, of 1, Chester Place, in the City of Norwich, Gentleman, the Executor therein named), are hereby required to send the Particulars in writing of their Claims or Demands to us the undersigned, the Solicitors for the said Executor, on or before the 20th day of August, 1889, after which date the said Executor will proceed to distribute the Assets of the said Deceased amongst the Persons entitled, having regard only to the Claims and Demands of which he shall then have had notice; and he will not be liable for the Assets of the said Deceased or any part thereof so distributed to any Person or Persons of whose Claims or Demands he shall not then have had notice.

Dated this 5th day of July, 1889.

WILKINS, BLYTH, AND DUTTON,
Solicitors for the said Executor.

112, Gresham House, Old Broad Street, E.C.

ROYAL CORNWALL POLYTECHNIC SOCIETY.

THE FIFTY-SEVENTH ANNUAL EXHIBITION
WILL OPEN
AT THE POLYTECHNIC HALL, FALMOUTH,
ON
TUESDAY, SEPTEMBER 10, 1889.

MEDALS AND PRIZES
Are offered in
MECHANICS, FINE ARTS, PHOTOGRAPHY,
NATURAL HISTORY,
AND OTHER DEPARTMENTS.

SPECIAL EXHIBITIONS OF DOMESTIC LIGHTING.

Board of Trade Certificate granted protecting unpatented Inventions.

For Prize Lists, Entry Forms, and all information apply to the Secretary,
EDWARD KITTO, F.R.M.S.,
The Observatory, Falmouth.

THE

GORING & STREATLEY

GAS & WATER COMPANY, LTD.

Directors.

EDWARD WALMISLEY, Esq., Director of the Brentford Gas Company, *Chairman*, 23, Abingdon Street, Westminster.

GEORGE E. MARTIN, Esq., 91, Talbot Road, London, W.

ALFRED GREEN, Esq., Director of the Ilford Gas Company, Ilford, Essex.

ROBERT FISH, Esq., Director of the Mid-Sussex Water Company, Bec Lawn, Streatham.

*HENRY J. ROBUS, Esq., Vice-Chairman of the Horley District Gas Company, Edgecombe House, Addiscombe.

* Will join the Board at the expiration of lease.

Consulting Engineer.

JABEZ CHURCH, Esq., M. Inst. C.E., F.G.S., 55, Parliament Street, Westminster.

Contractors.

Messrs. J. & H. ROBUS, 37, Walbrook, London.

The Directors of this Company invite application for the remaining unallotted Shares of £5 each.

THREE YEARS' INTEREST GUARANTEED.

The Directors and their friends have applied for and been allotted 500 Shares. The Works are being pushed forward vigorously; and a completion of same is assured in September next.

Intending Shareholders are invited to visit the Works now in progress.

Prospectuses may be obtained from Mr. W. H. Hardy, Secretary, 5, Great Winchester Street, London, E.C., or at the Works, Goring.

Allotments will be made in strict order of priority of application; and where no allotment is made, the deposit will be returned in full, without deduction.

TROTTER, HAINES, & CORBETT,
BRETTELLS' ESTATE
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS TILES, and every description of FIRE-BRICK,
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAYS
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ROBERT MARSHALL,
CANNEL COAL MERCHANT
97 WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

COKE BREAKERS,

FROM £14 EACH.
(THOMAS & SOMERVILLE'S PATENT.)

New Design, with two Cutting Rollers, making less Breeze than their old pattern.

GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, S.E.

THE ONLY RELIABLE

DRY CENTRE-VALVE.

WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.

ALSO MADE FOR TWO OR THREE PURIFIERS.

No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.

Write for Prospectus.

ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.

F. WECK, 86, NEW STREET, BIRMINGHAM.

CAST-IRON PIPES

FOR GAS AND WATER.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."

WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW

THE
"SILVER" LIGHT.

CHANDLER'S PATENT.

SUITABLE FOR EVERY FORM OF LIGHTING.

A beautiful white light from ordinary Gas. Silent, steady, and economical.

PACKED IN BOX 9s., SUBJECT.

S. CHANDLER & SONS,

Central Works, Kennington Oval, S.E.

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

GAS AND WATER PIPES.
1½ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
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"SPRINGBANK, GLASGOW."

THE
LANEMARK COAL Co., LTD.,
Now offer their superior
GAS COALS
LANEMARK CANNEL.
Yield of Gas per ton . . 10,880 cub. ft.
Illuminating Power . . 29·21 candles.
Coke per ton . . . . 1266·96 lbs.
LANEMARK GAS COAL.
Yield of Gas per ton . . 11,379 cub. ft.
Illuminating Power . . 17·88 candles.
Coke per ton . . . . 1285·53 lbs.
LANEMARK GAS BRIQUETTES.
Yield of Gas per ton . . 10,734 cub. ft.
Illuminating Power . . 22·70 candles.
Coke per ton . . . . . 1320 lbs.
For Prices and Analyses, apply to
LANEMARK COAL Co., Ltd.,
NEW CUMNOCK, N.B.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire GANNISTER BRICKS.
ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

THOMAS TURTON AND SONS, LIMITED,
SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING-JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft
Illuminating Power . . . . . 38·22 candles
Coke per ton . . . . . 1,301·88 lbs.
EAST PONTOP GAS COAL
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 70 per cent.
For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

GAS COAL.
POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12¼ cwt. of good coke.
This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

Jos. EVANS & SONS
WOLVERHAMPTON.

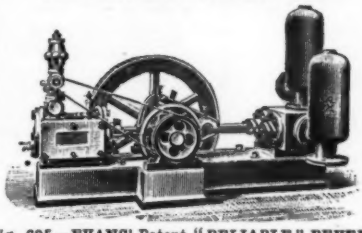



Fig. 685.—EVANS' Patent "RELIABLE" REVERSIBLE TAR and LIQUOR PUMP. The best Tar-Pump in the Market. Adopted by all the leading London and most of the Provincial Gas-Works; also on the Continent.
The Gaslight and Coke Company, Beckton, over 100 Pumps supplied.
Imperial Continental Gas Association, nearly 50 Pumps supplied.
South Metropolitan, Commercial, and Phœnix Gas Companies, London, H. M. War Office, &c.
NEW CATALOGUES ON APPLICATION.

Fig. 600.—"EVANS-TONKIN" Patent "CORNISH" DIRECT-ACTING STEAM-PUMP. NO TAPPETS

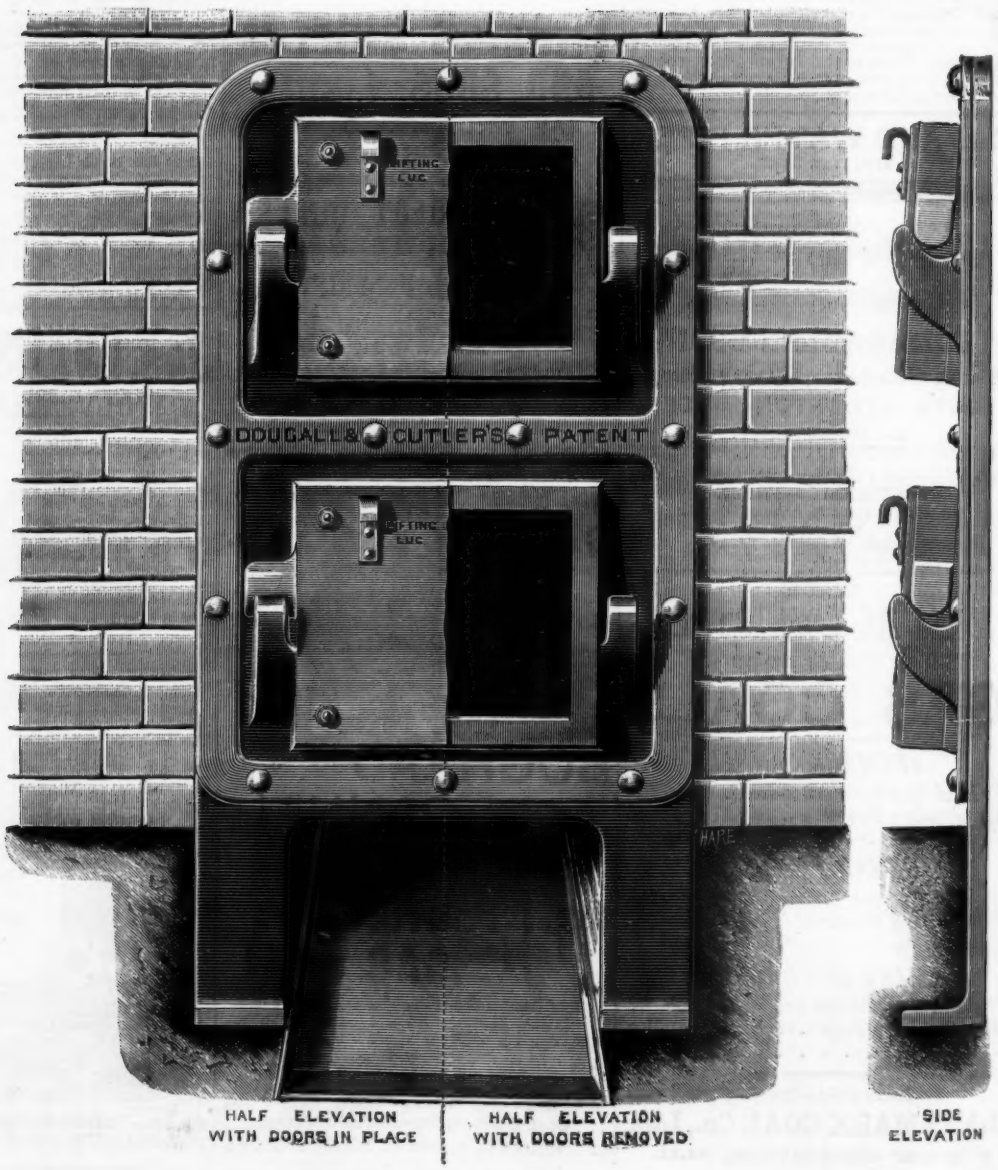
WARNER'S RETORT-HOUSE MACHINERY.
[*As Illustrated and Described in the* JOURNAL *for May* 4, 1880.]
Communications to be addressed to
W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

DOUGALL & CUTLER'S

Patent Door Attachments

— FOR —

FURNACE FRAMES.



HALF ELEVATION WITH DOORS IN PLACE | HALF ELEVATION WITH DOORS REMOVED | SIDE ELEVATION

See also Advertisement in Journal, June 25, p. 1194.

Further Particulars can be obtained from Mr. A. DOUGALL, Gas-Works, Tunbridge Wells; or from the SOLE MAKERS,

SAMUEL CUTLER & SONS, MILLWALL, LONDON.

CAST-IRON PIPES, ETC.

THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

CAMBRIAN FOUNDRY, NEWPORT, MON.,

MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM.

ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795). **WORTLEY FIRE-BRICK WORKS,**

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

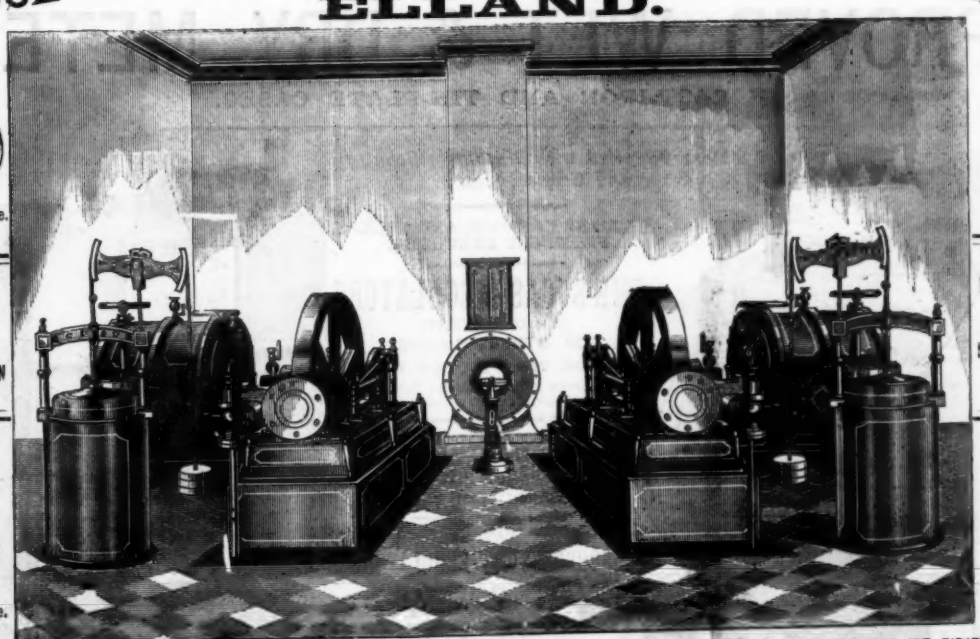
London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

R. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

ROSE MOUNT GAS ENGINEERING WORKS, ELLAND.

No. 1. Flange Valve.



No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION

NO HIGH SPEED

STEADY GAUGE.

No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

JOHN BROWN & CO., LIMITED,
ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 19-candle gas per ton.
Weight of illuminating matter in pounds of sperm, 820·80. Very free from impurities.

THE WIGAN COAL & IRON CO., LIMTD.,

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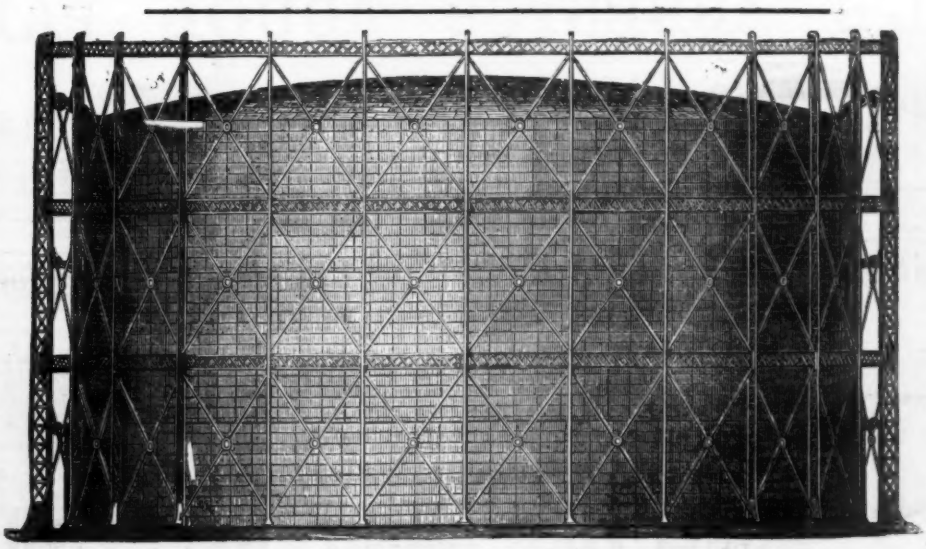

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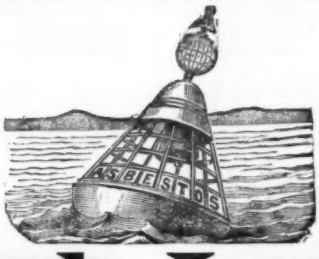

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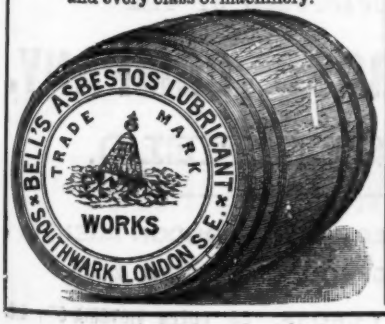

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ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

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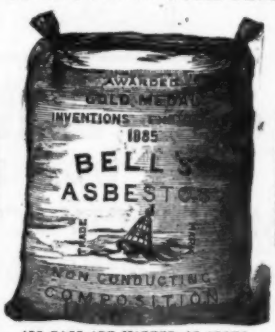
Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



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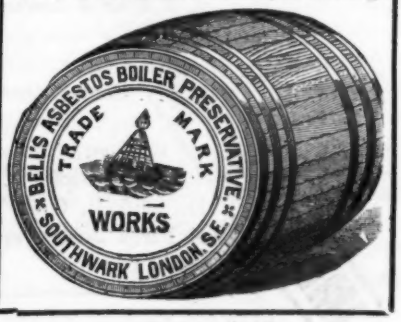

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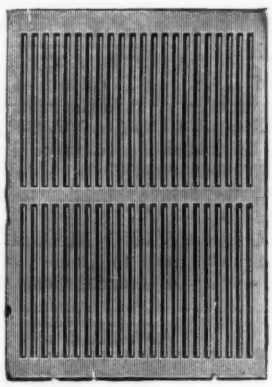

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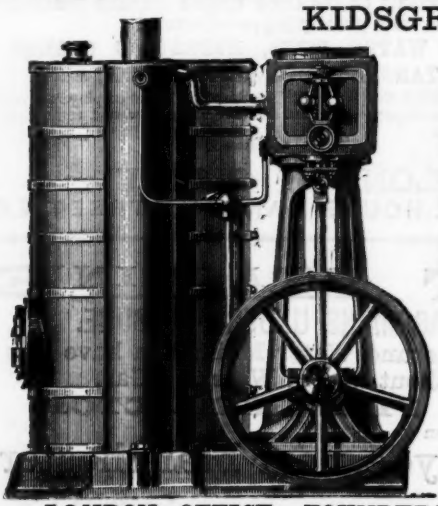

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